40 Rock



35p 3-9 March 1983 Vol 2 No 9

This Week

Hobbit competition
Who will be first to complete *The Hobbit*? If you have stumbled through Elvan Halls, met Gollum and battled with bloodthirsty trolls, you should enter our new competition on page 31

Spectrum software
Tony Bridge looks at a large selection of the latest Spectrum software. See page 12

Inside Atari
David Kelly talks to Graham Daubney of Atari on page 11

BBC and Education
Calvin Woodings explains the intricacies of Students 'T' significance test
See page 35

STAR GAME
Romeo and Juliet on 16K ZX81 by David Hanson. See page 8.

News Desk

Spectrum rival — the TX8000

THE TEXET TX8000 is a new computer offering similar capabilities to the Sinclair Spectrum machine.

With 8K Ram the 6502 machine runs Microsoft Basic and has eight colours and a *Beep* command. Although it has a moving key rubber keyboard, it will cost only £98.

It has 16 predefined graphics characters and a single keyword entry facility. Display is text 32 x 16 characters, text/graphics, 64 x 32 pixels, and high-resolution, 128 x 64 pixels. A cassette interface, memory expansion bus, peripheral port and tv output are provided. A memory expansion pack, giving 64K, will cost £52.

The machine, manufactured in Hong Kong by Video Technology, will be distributed in the UK by Cheadle Hulme based Texet beginning in April.

New micronet database

MICRONET 800, the Prestel-based telephone software service, has been officially launched.

As a special offer the first 10,000 subscribers will be able to connect up to the database for only £55. A quarterly subscription will also be charged.

Micronet will offer free games and educational programs, computer news and ac-
Continued on page 5

Spectrum power packs faulty

SINCLAIR is recalling some of its Spectrum power packs as they are faulty and could be dangerous.

Anyone who has bought a Spectrum since January 1 1983, should check their power pack immediately. If the lead between the power pack and the Spectrum is black with a white stripe the power pack should be returned to Sinclair (for further details see Letters page 7)

Classified

Computer Swap
01-930 3266
Free readers entries to buy or sell a computer
Ring 01 930 3266 and give us the details.

VIC20 with cassette unit 3K high res + machine code monitor cartridges + £70 games books joystick £230 ono 0273 808065

48K SPECTRUM over £100 worth software + 175 other programmes + 6 rolls printer paper worth over £300 Best offer over £225 secures Tel 01-656 1800 between 6—9 pm

APPLE II EURO +, 48K perfect condition + guarantee £500 Tel 051 753 1975 after 6 pm

SHARP PC1211 plus printer and cassette interface £65 Tel 0905 878101 ext. 371 for Philips

HAVE TOSHIBA Personal Hi-fi with stereo FM tuner pack plus pocket camera with power drive. Will exchange for ZX Spectrum Tel Warrington (0925) 813033

ATARI VIDEO GAME, 7 of the best cassettes including Basic program with key pads £130 Tel 01-304 0468

CBM 16K Ram pack for sale £45 one Micro! Rabbit software to swap with any other Tel St Helens 52689 (6 pm)

INTELLIVISION VIDEO 5 cartridges 3 months old £150 or swap for Spectrum Tel Sheffield 886185

JUPITER ACE, as new all leads, manual, etc cost £90 offers around £70 Tel Waltham Cross 7738

Continued on page 42

★ ★ BRITAIN'S HOME COMPUTER WEEKLY ★ ★



3-9 March 1983 Vol 2 No 9



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How to submit articles
Articles which are submitted for publication should not be more than 3 000 words long The articles and any accompanying programs should be original it is breaking the law of copyright to copy programs out of other magazines and submit them here — so please do not be tempted

All submissions should be typed and a double space should be left between each line Please leave wide margins

Programs should whenever possible be computer printed

We cannot guarantee to return every submitted article or program so please keep a copy If you want to have your program returned you must include a stamped addressed envelope.

Accuracy
Popular Computing Weekly cannot accept any responsibility for any errors in programs we publish although we will always try our best to make sure programs work

This Week

Editorial

The sixth ZX microfair, held at London's New Horticultural Hall last Saturday, was adjudged a great success by all concerned

Sinclair sold all its Spectrum stocks on display and Kempston also ran out of supplies of its Spectrum joysticks Queues for the entrance to the hall ran around the block, while inside people were standing four or five deep in front of some of the stalls Software companies were besieged by customers eager to see the latest releases for the Spectrum

Microfairs are a peculiarly British institution, and very much the brainchild of organiser Mike Johnston The first ZX microfair was held at the Central Hall, Westminster in November 1981 and attracted well over 5000 enthusiasts The combination of software houses, hardware manufacturers and magazine publishers, has proved irresistible to many, though there have been a few complaints of overcrowding and lack of facilities

A host of computer shows have been launched in the wake of the microfairs, from the giant Computer Fair in Earls Court to Argus's travelling road-show But none of these later offerings has quite the charm or friendliness of the original

Next Thursday

Can you defend your moisture farm from the hordes of thirst-crazed Womp Rats? Find out next week in Derek Spring's new game for the Spectrum.

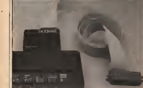
Also next week, Keith Brain looks at Telewriter — a word processor for the Dragon 32.

Atari (US) axes 1700 in manufacturing move

ATARI (US) has axed 1,700 jobs at its California head quarters following the announcement of disastrous financial results for the last quarter of 1983 (see *Popular Computing Weekly*, February 24)

The redundancies result from the company's decision to move manufacture of its home computers away from the US. Production of the Home Computer and Consumer Products Divisions is now to be consolidated in Hong Kong and Taiwan. Output from Atari's smaller plants in El Paso, Texas, and Puerto Rico is also to be stepped up

The 1,700 jobs lost represent nearly a quarter of Atari's employees at its Santa Clara base



Centronics interface from EuroElectronics

Spectrum serial parallel interfaces

BOTH RS232 and Centronics interfaces are now available for the ZX Spectrum

Cobra Technology is offering an RS232 communications interface for £30. This includes both the hardware and the software needed to drive it. The interface allows the Spectrum to communicate with other computers either directly, or by telephone link using a modem

The Menu-driven software will allow either half- or full-duplex and a data transfer rate variable between 75 and 1200 baud. An RS232 for the ZX81 is also available

EuroElectronics has developed a Centronics interface for the Spectrum. The ZX Lprint unit — which will cost around £30 — enables almost any dot-matrix or daisy-wheel printer to be run from the computer. Any number of characters per line can be configured from the Spectrum using the interface

For more information contact Cobra Technology, 378 Caledonian Road, Islington, London N1 and EuroElectronics, Zlin House, Oakfield Street Cheltenham

Micronet 800

Continued from page 1

cess to Prestel's existing pages. More advanced home and business software will be available at a cost 'far less than over-the-counter-prices'

"A complete new world of information and entertainment has been developed for microcomputer users," said Micronet's managing director, Richard Hease. He hopes to attract over 100,000 subscribers within three years

VCS 2600 grows up

A KEYBOARD add-on for the Atari 2600 VCS games machine giving the system computing power was announced in America last month

As well as providing a keyboard the unit will include an additional 8K Ram. It will go on sale in the US in the summer, priced around £60

At present there are no plans for Atari (UK) to launch the product

Sord and Aquarius get distribution

BOTH the Sord M5 and Matell Aquarius home computers will find their way into the high street shops following the conclusion of distribution agreements.

Computer Games Ltd is to handle the Sord machine. The computer should be available from the middle of March at a price now fixed at £189 95. Rom cartridges will cost £19 95. Computer Games Chairman Paul Balcombe said "Sord wished to concentrate its efforts on promoting its business computer range and we were on the look-out for a home computer to distribute. Hopefully we will sell the M5 machine through most major outlets — we already have dealings with Dixons, Smiths and Boots."

Micro Marketing has been appointed to distribute the Mattel Aquarius machine. The retail price has been fixed at £119 95 and the machine should make an appearance in the shops in June. Rom-based software has been priced at £21 95 and £25 95 for 4K and 8K cartridges, respectively. The thermal printer will be £129 95 and the data cassette recorder will be £59 95

Michael Scott of Micromarketing said "Mattel plan a promotional budget in excess of £1m and we believe the machine will have a big impact."

More of you than you thought

TWENTY percent of the British population are potential computer 'freaks' and wish they owned a computer

This startling fact is just one finding of a new consumer poll, carried out by market researchers, Mintel

Over one in thirty people already do own a micro and Mintel estimates that last year 470,000 under-£500 microcomputers were bought — more than three times the number for 1981. In money terms this represents sales of almost £100m

Mintel's figures indicate that 40 percent of these sales, by value, went to Sinclair's ZX81 and Spectrum machines. Commodore took an 18 percent share with the Vic20 and Acorn's BBC came third with 9 percent

The Dragon 32 came fifth — quite an achievement considering that the machine was only launched towards the end of the period from which the figures were drawn

Those with home computers tend to spend between £30 and £120 per year on software — those with the more expensive machines spend nearer the upper end of this range

The Market Intelligence Report on Home Computers is available from Mintel Publications, 7 Arundel Street, London WC2

Young marketeer

SEVENTEEN-year-old Derek Bartle has been appointed to set up and operate a UK distribution network for Mikrogen

In the last 18 months the company has expanded to produce both hardware and software for a variety of machines and has negotiated marketing deals with a number of established software houses, including Rabbit, Hilderbay and Saturn Developments

Mikrogen is currently poised to launch the first independent software for the Oric – two 16K adventure games Return to Earth *and* Mines of Saturn, *both priced at £5 95 plus 40p postage and packing. The company has also recently begun to sell a joystick unit and controller for the Spectrum*

To all owners of Sinclair ZX Spectrum computers URGENT

If you bought, or received as a replacement, a Sinclair ZX Spectrum computer since 1 January 1983, check your power supply (mains adaptor) *now.*

We believe that a batch of adaptors from one of our suppliers is faulty, and in certain circumstances might conceivably prove dangerous.

So... if, *and only if,* the lead between your power supply and your computer is black *and white* and you received it since January 1st:

1. Switch off at the mains, disconnect your system, and take off the plug.

2. Pack your power supply and post it to us at the address below *with your name and address enclosed.* Please do *not* return your computer, which is perfectly safe.

3. We will replace the power supply as soon as possible.

Please accept our apologies in advance for any inconvenience.

Send your power supply to:
Sinclair Research Ltd, Unit F, Broad Lane, Cottenham, Cambs., CB4 4SW.

sinclair

Airing on copyright

We have just read your magazine's article by Gail Counsell on copyright and computer software (*Popular Computing Weekly*, February 3-9). First let us say that we are very pleased to see that the topic is at last being aired in the press. It was a pity that Miss Counsell came out in favour, or so it seemed to us, of software libraries for we must voice our support of Bug-Byte and Silversoft in condemning these organisations. Lending software in itself is possibly commendable, but the almost inevitable copying of tapes can only damage the software industry, and in turn lead to higher prices (aren't they high enough already?) to compensate for lost revenue.

Our major concern though was over Gail Counsell's comments about compilers. The article showed that she has a complete ignorance of them — as witnessed by her statement that the object code they produce is 'very like machine-code'! It is machine-code, Miss Counsell. It was also very misleading of her to mention compilers and assemblers in the same breath as if they do a rather similar job. They do not. An assembler is very much like a tool in that it literally translates the programmer's input. However, the story is very different for Basic compilers.

There is naturally a great danger that your readers will take Miss Counsell's word as gospel, and for this reason we hope you will allow us to make the (admittedly confused) situation clearer. You can think of a compiler as two programs in one: the compiler itself and a series of 'run-time routines'. The compiler itself does the actual 'translation' and it uses the run-time routines to attain much of the resulting code (by calling these routines at appropriate times).

It could be argued that the translation is in a sense ''intelligent' — at least in stark contrast to the literal decoding an assembler undertakes. But we would acknowledge that it would be a lengthy court case that would sort out whether this translation constitutes a part ownership of the copyright of the final translated program.

What is less in dispute is the copyright of the actual game — the logic of it, the ideas that went into devising it, and so on. These we think are best considered the property of the writer, not of the company which supplied the compiler which did the translation. Once again, though, a court will one day have to decide this in a test case.

What we feel is clearest in this whole affair though — and it is this point we wish to make most strongly to your readers — is that *every program compiled with a compiler will contain within it the run-time routines which are quite definitely the property of the person or company which holds the copyright of the compiler itself*. And no program can be compiled without these run-time routines being present in the final code. The final code would not run if they were removed in whole or part.

It is thus on this basis that we feel quite certain that a program compiled with a compiler, such as ours for the 48K ZX Spectrum, is not wholly the copyright of the writer who used the compiler. We also feel that it is more than fair and correct that the company producing the compiler should ask some nominal fee or royalty as we (amongst others) do.

Finally, to put the matter in some perspective, writing a program in Basic is notoriously quicker for the vast majority of programmers than writing a 'similar' program in machine code. But with a compiler, someone writing in Basic can produce a program almost as distinguishable from one in customised machine code (which has taken a good m/c programmer many weeks to devise) in an evening or two. Surely that advantage more than offsets any nominal royalty a compiler producer might ask?

Tim Langdell
Softek
329 Croxted Road
London SE24 9DB

In your enthusiasm to defend the charging of royalties on compiled programs, you failed to note the point of the article. Gail Counsell's argument was that the work of the compiler would not be regarded as original in each case. So, on the present interpretation of the copyright law, the author of the compiler would not be able to claim any copyright on a compiled program.

On your other point — about software lending libraries — if you read the article more carefully, you will see that Gail Counsell did not 'come out in favour' of them. She simply explained that it is a difficult area of law.

And then it won't record

In December I purchased a Dragon 32. I am experiencing problems in recording programs. As we all know, it takes hours copying a program and usually even more hours debugging it. At the end of this you can imagine how I feel when I find that I cannot record it.

I purchased a new Sanyo cassette recorder and was told by the dealer that it would work. I have fiddled with the volume control (it has no tone control), and I can assure you that it is a very hit and miss affair.

Through your excellent magazine may I ask your readers if they have experienced similar problems, or better still, can they help?

P A Low
52 Janes Lane
Burgess Hill
West Sussex RH15 0QR

Yet another Basic quirk

May I add my morsel to the growing pile of Spectrum Basic quirks. If you Run the following routine it will wait for about four seconds before printing '1' (the delay being provided by line 10), then a further four seconds later (line 30), it will print '2'. And, if you press a key after the '1' has been printed it will terminate the *Pause*, and '2' will be printed immediately. So far so good.

But now try Running it and pressing a key *before* the '1' has been printed, ie while it is executing line 10. You will find that the *Pause* statement in line 30 lasts for no time at all!

```
10 FOR A=1 TO 300: NEXT A
20 PRINT 1
30 PAUSE 200
40 PRINT 2
```

It seems that a *Pause* command looks to see if a key is being *or has been* pressed. If this 'bug' is likely to be a problem you can get round it by adding a second (short) *Pause*, try changing line 30 above to

```
30 PAUSE 1: PAUSE 200
```

Mike Lord
Timedata Ltd
16 Hemnells High Road
Lamdon
Basildon
Essex SS15 6ED

Spectrum power pack probleme

We need urgently to contact a number of our customers who have purchased, or received as a replacement, a Sinclair ZX Spectrum computer, since January 1 1983.

Anyone in this category should *immediately* check their power supply/mains adaptor. We believe that a batch from one of our suppliers is faulty and in certain circumstances might conceivably prove dangerous. The batch is limited in number and easily recognised.

If, and only if, the lead between the power supply and the Spectrum is black with a white stripe then:

(1) Switch off at the mains, disconnect the system and remove the plug from the power supply.

(2) Pack the power supply and post it to Sinclair Research Ltd, Unit F, Broad Lane, Cottenham, Cambs CB4 4SW.

The computer itself is perfectly safe and should not be returned.

We will be replacing the power supply as soon as possible and would like to apologise to any of our customers affected for the inconvenience caused.

Finally, could I reassure all our customers that the problem is restricted to a limited number of Spectrums and affects none of our other products.

Nigel Searle
Managing Director
Sinclair Research Ltd
25 Willis Road
Cambridge CB1 2AQ

Romeo and Juliet

A new game for the 16K ZX81 by David Hanson

Romeo and Juliet is a mathematical adventure game for the 16K ZX81. When run, the program displays a graphic representation of the balcony scene from the play. The user is then requested to answer some mathematical questions — the level of difficulty can be adjusted to cater for seven- to 16-year-olds, or older, if required.

If the user answers enough questions correctly, then the scene changes. First, Juliet moves to the edge of the balcony. Next, she speaks to Romeo. Romeo then walks into the garden from beneath a tree. Juliet throws a flower which Romeo catches and an owl flies across the sky to perch in the tree.

Each player is given a maximum of 40 questions. As soon as a player answers 35 questions correctly, Romeo climbs up the balcony and embraces Juliet. If a player fails to answer 35 questions correctly, Romeo is shot in the back by an arrow.

A record of the number of questions, and the number of correct answers, appears in the tower beneath the balcony.

```
   5 REM [redacted]
  10 PRINT AT 4,8;"ROMEO AND JUL
IET"
  20 PRINT AT 10,0;"THIS IS A MA
THEMATICAL ADVENTUREGAME  AT 16,
0  AS YOU ANSWER CORRECTLY THE
   PICTURE STORY WILL UNFOLD"
  30 PAUSE 400
  40 CLS
  50 PRINT AT 10,0;"TYPE IN THE
LEVEL OF DIFFICULTY ,AT 12,10;"1
 TO 100"
  60 INPUT P
  70 IF P<1 OR P>100 THEN GOTO 4
0
  80 CLS
 100 REM [redacted]
 130 LET C$=[redacted]
 140 LET D$=
 150 LET E$=
 160 LET F$=
 170 LET G$=
 180 FOR E=0 TO 10
 190 PRINT AT E,0;A$
 200 NEXT E
 210 PRINT AT 3,0;[redacted],AT
     E$ AT 4,0;E$,AT 10,0;E$
 220 FOR E=6 TO 8
 230 PRINT AT E,0;D$
 240 NEXT E
 250 FOR E=11 TO 17 STEP 2
 260 PRINT AT E,0;C$,AT E+1,0;E$
 270 NEXT E
 280 PRINT AT 19,0;F$
 300 REM [redacted]
 310 PRINT AT 6,28;"  ",AT 7,28;
     AT 8,28;"  ",AT 9,27;"
     AT 10,27;"  ",AT 12
 320 PRINT AT 11,28;"   ",AT 14
,28;"   ",AT 13,27;"
 330 FOR E=15 TO 18
 340 PRINT AT E,31;" "
 350 NEXT E
 400 REM [redacted]
 410 LET K=
 420 LET J=
 430 LET S=1
 440 LET R=
 450 PRINT AT K,J;" ",AT K+1,J;"
 ",AT K+2,J
 460 PRINT AT S,R;" ",AT S+1,R;"
 ",AT S+2,R;"
 470 PRINT AT 0,27;" ",AT 1,27
 ;" ",AT 2,2;"
 480 PRINT AT 0,0;" ",AT 0,3;"X
 " 1 ,AT 2,3
 500 LET N=1
 510 LET TOT=0
1000 REM [redacted]
1010 LET P=INT (RND*10*P)
1020 LET B=INT (RND*5*P)
1030 LET C=INT (RND*10*P)
1040 LET F=INT (RND*5*P)+1
1050 LET G=INT (RND*2*P)
1060 LET H=P+B
1070 LET Z=C-F
1080 LET M=G*P
1090 LET O=A+G
1100 PRINT AT 20,0;O$,AT 21,0;O$
1110 PRINT AT 20,0;"WHAT IS ";P;
" + ";B;" ?"
1120 INPUT X
1130 IF X<>H THEN PRINT AT 21,0;
"  THE ANSWER IS ";H
1140 IF X=H THEN PRINT AT 21,0;"
  THE ANSWER IS ";H
1150 IF X=H THEN GOSUB 4000
1160 GOSUB 4800
1200 PRINT AT 20,0;O$,AT 21,0;O$
1210 PRINT AT 20,0;"WHAT IS ";C;
" - ";F;" ?"
1220 INPUT X
1230 IF X<>Z THEN PRINT AT 21,0;
"  THE ANSWER IS ";Z
1240 IF X=Z THEN PRINT AT 21,0;
"  THE ANSWER IS ";Z
1250 IF X=Z THEN GOSUB 4000
1300 GOSUB 4800
1300 PRINT AT 20,0;O$,AT 21,0;O$
1310 PRINT AT 20,0;"WHAT IS ";M;
" / ";P;" ?"
1320 INPUT X
1330 IF X<>G THEN PRINT AT 21,0;
"  THE ANSWER IS ";G
1340 IF X=G THEN PRINT AT 21,0;"
  THE ANSWER IS ";G
1350 IF X=G THEN GOSUB 4000
1360 GOSUB 4800
1400 PRINT AT 20,0;O$,AT 21,0;O$
1410 PRINT AT 20,0;"WHAT IS ";A;
" X ";G;" ?"
1420 INPUT X
1430 IF X<>O THEN PRINT AT 21,0;
"  THE ANSWER IS ";O
1440 IF X=O THEN PRINT AT 21,0;"
  THE ANSWER IS ";O
1450 IF X=O THEN GOSUB 4400
1460 GOSUB 4500
1500 GOTO 1000
4000 REM [redacted]
4010 IF N<6 THEN GOSUB 8000
4020 IF N=6 THEN GOSUB 8500
4030 IF N>6 AND N<11 THEN GOSUB
6000
4040 IF N=11 THEN GOSUB 6500
4050 IF N>11 AND N<20 THEN GOSUB
 6000
4060 IF N=20 THEN GOSUB 7000
4070 IF N>=20 AND N<34 THEN GOSUB
 7500
4080 IF N=34 THEN GOTO 8000
4090 LET N=N+1
4100 PRINT AT 17,1;N
4200 RETURN
4500 REM [redacted]
4510 LET TOT=TOT+1
4520 IF TOT=40 THEN GOTO 8800
4530 PRINT AT 17,5;TOT
4540 RETURN
5000 REM [redacted]
5010 PRINT AT K,J;" ",AT K+1,J;"
 ",AT K+2,J;" "
5020 IF J=8 THEN GOSUB 5500
5030 LET J=J+1
5040 RETURN
5500 REM [redacted]
5510 LET Z$=[redacted]
5520 PRINT AT 6,10;"ROMEO,ROMEO"
,AT 7,10;"WHEREFORE",AT 8,10;"
ART THOU",AT 9,10;"ROMEO ?"
5530 PAUSE 400
5540 PRINT AT 6,10;Z$,AT 7,10;Z$
,AT 8,10;Z$,AT 9,10;Z$
5550 RETURN
6000 REM [redacted]
6010 LET R=R-1
6020 PRINT AT S,R;" ",AT S+1,R
,AT S+2,R
6030 RETURN
6500 REM [redacted]
6510 LET X=400*COS (PI/3)
6520 LET Y=400*SIN (PI/8)
6530 FOR Z=0 TO Y/10
6540 LET U=.01*(Y*Z-10*Z*Z)
6550 UNPLOT .01*X*Z,U+10
6560 GOSUB 9000
6570 PLOT .01*X*Z,U+10
6580 NEXT Z
6590 RETURN
7000 REM [redacted]
7010 FOR D=0 TO 26
7020 PRINT AT 8,D;" ",AT 8,D;
"
7030 NEXT D
7040 PRINT AT 8,27;" ",AT 8,2
7050 RETURN
7500 REM [redacted]
7510 LET S=S-1
7520 PRINT AT S,R;" ",AT S+1,R;
",AT S+2,R;" ",AT S+3,R;" "
7530 RETURN
8000 REM [redacted]
8010 PRINT AT 13,8;" ",AT 12,8;
8020 PRINT AT 11,0;" ",AT 10,0
8030 PAUSE 100
8040 PRINT AT 11,0;" ",AT 8,8
,AT 9,0;" ",AT 10,8
8050 PAUSE 100
8060 PRINT AT 10,0;" ",AT 8,0;"
 ",AT 8,0;" ",AT 7,0
8070 PAUSE 100
8080 PRINT AT 7,0;" ",AT 8,8
,AT 8,0;" "
8090 PAUSE 400
8100 PRINT AT 6,10;"GOODNIGHT GOODNIGHT",AT
 7,10;"GOODNIGHT",AT 8,10;"PA
RTING IS",AT 9,10;"SUCH SWEET",A
T 10,10;"SORROW."
8110 PAUSE 400
8120 LET P$=[redacted]
8130 PRINT AT 6,10;P$,AT 7,10;P$
,AT 8,10;P$,AT 9,10;P$,AT 10,10;P
$
8150 LET J=J-1
8160 PRINT AT K,J;" ",AT K+1,J;"
 ",AT K+2,J;" "
8170 IF J=8 THEN GOTO 8800
8180 GOTO 8150
8200 PRINT AT 7,0;" ",AT 8,0
,AT 9,0;" "
8210 PAUSE 100
8220 PRINT AT 7,0;" ",AT
,AT 8,0;" ",AT 10,0
8230 PAUSE 100
8240 PRINT AT 8,0;" ",AT
8250 PRINT AT 11,0;" ",
8260 PAUSE 100
8270 PRINT AT 10,0;" ",AT
8280 FOR S=1 TO 15
8290 PRINT AT S,0;" ",AT S+1,0
,AT S+2,0;" ",AT S+3,0
8300 NEXT S
8310 FOR R=0 TO 20
8320 PRINT AT 15,R;" ",
R  ,AT 15+2,R;" "
8330 NEXT R
8340 LET Q$=""
8350 FOR E=6 TO 12
8360 PRINT AT E,10;Q$
8370 NEXT E
8380 PRINT AT 8,10;"WELL DONE",
AT 8,10;"PRESS Z FOR ",AT 10,10;
"ANOTHER",AT 12,10;"TRY"
8390 INPUT Z$
8400 IF Z$="Z" THEN GOTO 100
8410 STOP
8500 REM [redacted]
8510 LET S=20
8520 PRINT AT S+1,D;" ",AT S+1,D
8530 LET S=S-1
8540 IF S=F THEN GOTO 8800
8550 GOTO 8500
8600 PAUSE 100
8610 PRINT AT S-1,R;[redacted]
,AT S+1,R;"  ",AT
8620 IF S=16 THEN GOTO 8700
8630 LET S=S+1
8640 GOTO 8610
8700 PRINT AT 16,R;"  ",AT 17,R
,AT 18,R;" "
8710 PAUSE 100
8720 PRINT AT 7,7;" ",AT 8,7
,AT 8,7;" "
8730 LET J=J-1
8740 PRINT AT K,J;" ",AT K+1,J
,AT K+2,J;" "
8750 IF J=8 THEN GOTO 8800
8760 GOTO 8730
8800 LET Q$=""
8810 FOR E=6 TO 12
8820 PRINT AT E,10;Q$
8830 NEXT E
8840 PRINT AT 8,10;"HARD LINES",
AT 8,10;"PRESS Z FOR ",AT 10,10;
"ANOTHER",AT 12,10;"TRY"
8880 INPUT Z$
8890 IF Z$="Z" THEN GOTO 100
9000 REM [redacted]
9010 FOR V=1 TO 6
9020 NEXT V
9030 RETURN
9500 STOP
```

Talking of Atari

***David Kelly** talks to Graham Daubney, Atari (UK)'s product manager*

When Atari's 400 and 800 machines were launched in the US back in 1979, they were among the first home computers to be seen in the US.

In the four years since then, the Atari machines have become extraordinarily successful in America. But this success has not been repeated in Britain, largely due to their high price compared with other micros.

To try to shake things up a bit, Atari formed a UK company last April. It's first employee was Graham Daubney.

"One of the problems over the last year," he says, "has been that in some ways the name of Atari is not associated with computers. Because of our success with the coin-operated games and the VCS games machine, people have tended to think that the Atari home computers are games machines. Perhaps our biggest problem has been to explain that with all that graphic power and speed — to produce the best games — you have to have an awful lot of computing power. Those people who have bought the Atari system have found that out — even we have been surprised at the number of disc drives we have been able to sell in Britain.

"There is a lot of marketing hype going on at the moment — Atari doesn't want to get involved in that. We are very happy with the start we have made in the UK.

"Rather than playing at numbers, we would prefer to play at quality and service," says Daubney. "It is nice to sell a lot of boxes but, equally, it is important to sell them in the right way — with 100 service centres up and down the country. It is good to know there are guys downstairs answering end-user enquiries."

It is ironic that many of Atari's problems of image have often caused by its success in the video games field. The Atari name is synonymous with the best in games software. Even now, 10 years after Atari produced the first arcade video game, *Pong*, the company has a strong leaning towards entertainment software.

Each of the company's three divisions — Coin Operated Games, VCS Games and Home Computers — has its own software development team. Over the years this has resulted in the development of many of the most successful arcade games, *Asteroids*, *Centipede* and, recently, *Tempest*.

Part of the reason Atari (UK) came into being was to provide a British software development facility. Atari is particularly keen to produce material for the British educational market.

"The main aim is to translate existing material where appropriate," says Daubney. "Most of the entertainment software is directly applicable. The same things go down well both in the States and here.

"We are also signing contracts with third parties to produce software for the UK and Europe. If we decide we want a particular piece of software on the Atari, we provide the programmer with whatever hardware and software tools are necessary and a technical assistant who will see the project through to the end. In short, the programmer will be actively supported by us. Alternatively, if a software house develops something that is new, we may negotiate for a licence — but our standards are rather high.

"In fact, on the entertainment side, there is not a lot that we would want to contract out — we wouldn't want to buy back *Pac-Man*, version twelve.

"We are actively developing educational software. Even though Atari is not one of the recommended micros in schools, we are hoping for great things — if the Computer Studies room has a computer that is not ours, I will be quite happy with the rest of the school, the music room, the art room, the geography room!"

Atari in the US has just concluded licensing agreements with Disney and United Feature Syndicate to use the Disney and Peanuts cartoon characters. Atari machines are well-suited for cartoon animation. Instead of having to flip pages to get animation, it is possible to change character sets. The cartoon figure is defined in different positions using the same alpha-numeric symbol in different character sets. This incidentally is the technique Atari uses in its version of *Space Invaders*.

On the hardware side, there is now the new 1200XL machine. You will definitely see that in this country, though probably not until the Autumn. In line with Atari's philosophy, it is software-compatible with both the 400 and 800 machines. There are also new peripherals — a new plain paper four-colour printer and a new cassette deck.

"Also, as of the back end of last year, Atari has its own semiconductor division in Sunnyvale, California — so now we are in a position to design our own custom chips and reduce development times. We are also one of the few companies investing money in long-term software development.

"On our home computers we have some of the best games available — *Space Invaders*, *Galaxians*, *Missile Command*, *Asteroids*, *Pac-Man* and *Centipede*. Some are our own. But we are prepared to go to other coin-op companies and buy licences. We pay a lot of money for such licences and operate in a proper business-like manner."

Graham Daubney, Product Manager of Atari (UK)

For this reason Atari has begun to take action in the UK and in America to protect its interests — its copyright and its licences.

"Instead of people looking at our action as Atari playing the big bad Daddy, people should be asking themselves: where is software development going to go if everyone keeps ripping off the same programs? Software must go forward — people have to sit down and come up with their own games.

"The situation is changing though. Licensing agreements are becoming accepted. Take *Frogger* — one of last year's biggest arcade games. We don't have the rights to produce a *Frogger* game — and so we haven't. Parker got the licence for the home video game and Sierra On-Line got the licence for home computer games.

"A problem is that there isn't much point in spending a lot of money on a licence if you haven't got the hardware to do the game justice. This is why Atari has such a depth of software — we are one of the very few companies around that has hardware capable of producing an acceptable version of an arcade game. There would be no point in Sinclair spending a lot of money on a licence to make a ZX81 version of some fantastic vector-plotted arcade game!

"But the major companies are beginning to see the light. For the smaller software houses it is now a question of how close to the wind they can sail.

"It seems inevitable that you will have clones of the best programs — the only consolation is that it is an indication that you are doing it right! But it seems strange. Something truly original *must* be more profitable at the end of the game.

"In the States we are now having a remarkable amount of success with clear cases of passing-off. In the UK we have been very successful out of court — many software houses have been sensible.

"This isn't Atari waving the big stick. It has made people aware that a system is beginning to develop within the industry and that these programs are not public domain.

"Anybody who puts out a program tomorrow based around one of the Disney characters would expect some action against them. Whey should they think they can do the same sort of thing to Atari?" ■

Sinclair's little mascot

***Tony Bridge** trips the light fantastic in search of Spectrum software*

Much of the success of the Sinclair machines, apart from sheer value for money, has been due to the wide range of software available. Any of the machines now snapping at Sinclair's heels will have to do battle with software catalogues as their main weapon. With the knowledge gained from the ZX80/81, programmers have seized the Spectrum by the throat, and taken full advantage of its colour, graphic and sound capabilities to produce programs that were undreamt of a few months ago.

Many of these programs are updates of ZX81 software, with some authors taking full advantage of the colours available, the high resolution graphics and the huge extra memory of the 48K version. ICL's tapes, marketed by Sinclair themselves, take advantage of none of these, and are as abysmal as the same programs were for the ZX81. Other software manufacturers working under the Sinclair banner are, thankfully, more ambitious.

Psion has retained its position, and my vote, as one of the best software houses around, with several new tapes for the Spectrum. *Flight Simulation*, which was my favourite program for the ZX81, now receives a much-welcomed update for the 48K Spectrum.

For those of you who did not see the earlier version, the program's scenario has you in the Captain's seat of a single-engined light plane, with a limited amount of fuel, and the job of landing the plane properly. Using 40K of memory, the new version is even more stunning than the old. Now there are two airports to land at, Main and Club — rather than the single one of the ZX81 version — and lakes and hills are dotted around the countryside.

On loading, you are presented with the choice of three modes — starting in level flight, on final approach, or about to take off. You may also elect to have wind effects. An instrument panel is presented to you, containing all the dials you will need for your flight — fuel and power gauges, flap and landing gear indicators and instrument landing system.

As you approach your finals, the instrument landing system will show your plane's position relative to the correct glide-path. If you dip below the central line you will have to put the aircraft's nose down to steepen your angle, and so on.

A large central dial is dedicated to the navigation system, and shows your position in regard to the beacons set at strategic points around the flying area. At any time you may call up a map, and you will see your position, shown by a little flashing plane. The beacons and the landmarks are also shown. The lakes and hills will appear in full perspective, as will the runway when you finally reach it.

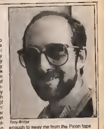
Words, however, cannot do justice to this program, which apparently took some eight thousand man-hours to complete! The feeling of actually flying a plane is very strong — after some practice I eventually managed to land the ZX81 version fairly regularly, but I have not got close to a successful completion in the Spectrum Flyer. *Flight Simulation* is surely the best of its type, and is unreservedly recommended (not least for the quote from my previous review of the ZX version which appears on the present version's artwork)!

As a direct contrast, let's leave Psion/Sinclair for a moment and look at another flight simulation program. Again this is an updated version of a ZX81 program, *Nightflite* from Hewson Consultants, is written for the 16K Spectrum, and the restrictions placed upon the programmer by the smaller memory are painfully obvious when compared with the Psion tape.

An instrument panel is presented to the player, but consists of digital readouts of speed, height and so on. There is also a square artificial horizon and instrument landing system, together with a circular automatic direction finder. No view is offered from the cockpit window until the final approach, when the lights of a runway and a neighbouring village may be seen.

This view moves unrealistically at one 'frame' a second, unlike Psion's smooth 3D movement.

The keyboard is read only once every two seconds, and only one direction movement is made at a time, thus making it impossible to bank and dive at the same time. While the "feel" of flying is absent from this program, the navigation aspect is emphasised, making it more of an academic exercise than Psion's thrilling "seat-of-the-pants" simulation. The provision of a map at the end of your flight, is also a feature which Nightflite provides and which is absent from the Psion program; this, though a nice touch, is not enough to sway me from the Psion tape.


Tony Bridge

To return now to Sinclair's own updated programs, we come next to *Reversi*, by MOI (Mine Of Information). What was a generally well-received version for the ZX81 has become a very sophisticated program for the 16K Spectrum. Also known as *Othello*, this is an absorbing board game of territorial possession, played on a battlefield of squares like chess. The computer plays a good game, or you may choose to play against a human opponent. There is a useful option to review all the moves of a game, and you may also take over and continue play from any point.

Other companies, too, apart from Sinclair, have been busy translating ZX81 programs to the Spectrum. One of these is Microgame Simulations, with *Battle of Britain* for the 48K model. This program puts you in command of the *few* Allied fighters against the *mean and many* German bombers at the start of World War 2.

In the ZX81 version information scrolled up the screen, and the movements of the opposing squadrons were worked out by the player on a separate map. With the Spectrum's extra memory and hi-res graphics, it is now possible to show the map (of South East England) on-screen. Sound may be requested by the player, which takes the form of Morse code transmissions, but this slows down the action so much as to become a little-used option for most people.

Battle is joined when squadrons of fighters are within one square of a wing of bombers. I found it hard to tell just where the bombers were heading for, and which targets I should be protecting. It was also a little disconcerting to see the enemy, which had been slowly approaching the coast at Eastbourne, suddenly disappear and reappear over a target at Gravesend, which of course was then obliterated. My poor squadron, which had been lying in ambush, was left wandering about 100 miles away! However, on talking to Microgame I understand that this is a deliberate

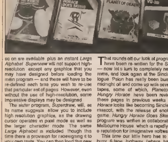
feature of the game You are shown the enemy's last known position, not their current whereabouts

If you enjoy strategic board wargames of the Avalon Hill variety you will certainly enjoy this one — let's hope that Microgame Simulations gives us more programs of this type, for which there is surely a great demand

Artic's Adventures (A to D) have sent many thousands of ZX81 owners to the edge of insanity with their near-impenetrable puzzles Now the same Adventures appear under the Sinclair name in the latest catalogue While the other three Adventures have been written for the 48K model thus pointing to more locations, Adventure A or *Planet of Death* is for 16K only As far as I have progressed (the little slimy Green Man), the program seems to follow the same scenario as the ZX81 version If you are an Adventure fan, then I urge you to look at Artic's offerings which I guarantee, will have you screaming within half an hour!

Video Software, from that well-known metropolis, Kinver, has always been highly regarded for its excellent Sinclair programs *Superview* allows you to design and show your own Prestel-like information Written for the 48K Spectrum the program gives you the choice of either 21 pages in full colour or 42 pages in two colours

Designing the pages at the computer takes a long time, so Video Software thoughtfully provides a pad of worksheets to ease the task The full range of Spectrum attributes *Flash, Bright, Inverse* and



so on are available plus an instant *Large Alphabet Superview* will not support high-resolution except any graphics that you may have designed before loading the main program — and these will have to be re-defined each time you wish to re-use that particular set of pages However, even without the use of high-resolution, some impressive displays may be designed

The sister program, *Superdraw*, will, as its name suggests allow you to include high resolution graphics, as the drawing cursor operates in pixel mode as well as the larger character mode The same *Large Alphabet* is included though this time there is provision for redesigning it to your own taste You can then load this new alphabet into your *Superview* program So if you have the larger memory, I would recommend you obtain both programs to give you a totally flexible package

The uses to which you can put the Prestel-style display are obvious — school fetes exhibitions and so on *Superdraw* written for the 16K machine will only hold one page at a time in Ram, but using the *Screen$* function will load a new page from cassette at a given interval thus giving an illusion of a slideshow albeit not as smooth and impressive as with *Superview*

Tasimeq is from Tasman makers of the well known word processor *Tasword* for the ZX81 *Tasimeq* is an educational tool that originally appeared for the ZX81 and is designed to help students come to grips with simultaneous equations Nothing much has changed from the original, except for the use of colour Still an excellent program, however and one of the few educational tapes for the Sinclair machines that actually does promote understanding Recommended

Jack Gibbons with his *Personal Banking System* for the ZX81, had an enormous and deserved success This was due not only to the program itself, which was extremely comprehensive, but also to the backup service that he provides to all purchasers He has now released a version for the Spectrum which is equally good A manual accompanies each tape to help you through all the features The only detail I miss from the earlier version is the fast-loading of data which was managed by a machine-code routine courtesy of Picturesque However, if there is only one home finance program you intend to buy, this should be it.

That rounds off our look at programs that have been re-written for the Spectrum — now let's turn to completely new programs, and look again at the Sinclair catalogue Psion has really been burning the midnight oil and come up with several new tapes, some of which, *Planetoids* and *Hungry Horace* have been reviewed in these pages in previous weeks *Hungry Horace* looks like becoming Sinclair's little mascot, with the release of another *HH* game *Hungry Horace Goes Skiing* This program was written in collaboration with Melbourne House which is rapidly gaining a reputation for imaginative software

This time our little hero has to cross a busy 6-lane highway (where have you heard that before?) in order to reach a little ski shop where he can purchase skis for the second part of the game He starts with $40 (why not £s?) and will need $10 to buy the skis In crossing the road, *Horace* will probably, under your guidance get run down in which case an ambulance will rush out and pick him up — asking for a fee of $10! Should this make you bankrupt you cannot go on to the second part, which is a downhill ski race

Points are scored for doing the right things at the right time and of course it is not as easy as it looks! Like the original *Hungry Horace* this is an amusing twist on a, by now, rather long-toothed original (or rather two LTOs) and will certainly tone up your reactions I think we can look forward to more *Hungry Horace* games

To the *VU* series *(VU-Calc* and *VU File)* Psion/Sinclair has now added *VU-3D* This is a "very impressive three-dimensional modelling program", to quote from Sinclair's catalogue, and that says it in a nutshell The user can design an object and then view it in perspective and from all angles, and zoom in and out The object may be displayed in "wire-frame" or as a solid and shaded as required

The drawing-board is fairly comprehensive, although a little practice is required to make full use of its capabilities The finished model may be *Saved* for later amendment, and hard copies taken The program makes excellent use of the Spectrum's resolution, which admittedly, is not of the highest and would be extremely useful on an engineer's desk — stunning value at the price!

David Miller, of Gwent, sent in three tapes for review (he has released another five, with a new machine code game on the way) *Plane Attack* is yet another re-working of the *Bomber* program (an LTO if ever I saw one!), in which a plane is for some selfish reason attempting to raze a city of skyscrapers so that it may land This version has a couple of new features — you may move the plane up and down in a limited way and the city fires back But, on our copy the user defined graphics refused to load properly

Patience and *Bio Rhythms* are fairly self explanatory and hold no surprises As part of a larger compendium of games these three might be worth looking at, but on their own they are simply not good value for money Better to save your money for

Arcadia from Imagine Software As you may have guessed, this is a Liverpool-based company, formed by three ex-Bug-Byte colleagues The promise of the eye-catching artwork is fully realised in the program The avowed aim of this new company is to bring you only totally original arcade games *Arcadia* is of the Space Zap variety in which you control a space ship protecting your planet from marauding hordes of invaders However the stunning graphics lift this game into a class of its own

You have five lives, and you will need all of them as wave upon infinite wave of amazing aliens descend upon you most of them dropping bombs as they do so In the

first level, the aliens are standard space vessels and you get one point for each alien destroyed (in successive waves you get more points) A counter at top left ticks down from 99 to 0 at which point the aliens give up with the puny first wave and launch the second wave which consists of giant bomb-dropping multi-coloured butterflies, would you believe?

Successive waves consist of Nasty Nails Orrible Octupuses and — well, find out for yourself! Suffice to say that some of the higher levels are so deadly that they don't even need to drop bombs! There are a lot of surprises — for instance somewhere in the higher levels is a mini-*Centipede* game Luckily, Imagine provided a special review copy written just for arthritic-fingered old reviewers (OK just like me!), giving the player 99 lives — on the first playing I have to admit that I ran out of all of them before the 12th level!

The stunning graphics have no equal in the Spectrum field and are as good as any Atari game and that is the highest praise that I can give Imagine Software has, with this program certainly emulated the genius of their namesake's composer Eugene Evans of Imagine tells me that *Schizoids* the latest Spectrum game from his company is twice as good as *Arcadia* — just imagine !

Staying with the arcade games we come to *Gnasher* from R&R Software This is a version of *Pacman* The graphics are faithful to the original down to the fruit at the bottom run of the maze which have to be devoured for extra points They also appear beneath the maze to remind you which level you are currently negotiating

The ghosts will chase you relentlessly, and the game is very addictive as you try desperately to outrun them and beat the high score A *Hold* feature is included so you can take a breather, and you can also *Save* your high score for posterity This program proved to be a favourite with all the neighbourhood arcade-gamers and is well worth the asking-price

We shall take a breather now, and slow things down a little with *ZXTrek*, from Cleva The game of *Startrek* or Klingon-bashing, has been around since the earliest days of the big mainframes, and was one of the first games available for microcomputers Peter Lovett the author of this latest but surely not last version has taken full advantage of the larger memory of the Spectrum to produce a more detailed game than usual The Battle Manual (documentation) alone runs to nine pages and is very L-O-G-I-C-A-L!

The display on the screen is devoted to long short- and Galaxy-scanners, and an awful lot of information about the state of the Enterprise (and Life and the Universe) is shown to the player As you will know the aim is to rid the Universe of the Klingons — here they are aided by the dreaded Romulans which appear without warning to wreak havoc A typically slow trudge of a game but if like me you enjoy *Startrek* programs you'll find this one more interesting than most

Haven Hardware offers *Patience* and *Fruit Machine* The latter is fairly ordinary, being an unsurprising simulation of a one-armed bandit which is very similar to those found in many books for the Spectrum *Patience* is a much more interesting program, which shows off the Spectrum's graphics Cards are laid out in several descending rows containing one to seven cards The remaining cards are held in a pack which is turned over three cards at a time

Cards may be placed on any of the rows as long as they are of a different colour and one rank lower than the immediately preceding card Aces are placed on one side As in real Patience your game depends on luck in the early stages — in the later stages, on laying the right card on the right pile When you feel like passing a quiet couple of hours, load *Patience* in and settle back

Casa Computer Systems of London has added a couple more programs to its range of management simulations The first, *Dallas* continues in the tradition

As you might expect, this one deals with the vagaries of the oil business in Texas. This is more of a board game than the other games in the series, *Autochef*, *Air line* and *Print Shop*, and is a direct descendant of those well-loved property acquisition games A fine balance must be sought between prospecting for more, black gold and developing the fields already struck All the while the Ewing family is sneakily building up their resources, and your aim is to eventually become worth more than JR (lovely thought!)

CCS's other new release is a departure from his usual games programs though it still involves the world of high finance *Financial Modeller X* comes in both 16K and 48K versions A hefty manual explains how to use the programs Designed mainly for management trainees, or indeed any manager wishing to make forecasts about his business, the program allows several models to be designed

Data is input by the user about advertising expenditure, sales force, production capacities and so on The computer will then act upon the data make forecasts concerning the profitability of each model, and compare one with another Hard copies may be taken, thus building up a comprehensive profile of financial options Good value for money

Richard Shepherd Software of deepest Maidenhead, has had an extensive catalogue of Sinclair software for some time, and has now released several programs for the Spectrum mostly Adventure games In *Shaken not Stirred* (48K) you are cast as James Bond and your task is to seek out the island of the dreaded Dr Death, who is threatening London with extinction unless his ransom demand is met You may choose three weapons with which to fight the many foes you will meet on your journey around the world

Transylvanian Tower is set in Dracula's castle and is a graphic maze-cum Adventure game There are several levels

Firm	Program	Cost
Psion	*Flight Simulation*	£7.95
2 Huntsworth Mews	*VU-3D*	£9 95
Gloucester Place		
London NW1		
Psion Melbourne House	*Hungry Horace Goes Skiing*	£5 95
2 Huntsworth Mews		
Gloucester Place		
London NW1		
Imagine Software	*Arcadia*	£5 50
Masons Buildings		
Exchange Street East		
Liverpool L2 3PN		
Microgame Simulations	*Battle of Britain*	£5 95
73 The Broadway		
Grantchester		
Cambridge CB3 9NQ		
Video Software	*Superdraw*	£6.00
Stone Lane	*Superview*	
Kinver		
Stourbridge		
West Midlands DY7 6EQ		
R & R Software	*Gnasher*	£4.95
34 Bourton Road		
Tuffley		
Gloucester GL4 0LE		
Richard Shepherd Software	*Shaken not Stirred*	£6 50
22 Green Leys	*Transylvanian Tower*	£6 50
Maidenhead		
Berkshire SL6 7EZ		
CCS Software	*Dallas*	£5.00
14 Langton Way	*Financial Modeller X*	£5.00
London SE3 7TL		
Calpac	*Junior Education*	£5 90
108 Hermitage Woods Crescent		
St Johns		
Woking		
Surrey GU21 1UF		

to the castle each one containing a matrix of 100 rooms As you explore the castle each room is presented to you in 3D graphics You must work your way through the complicated structure, picking up treasure and fighting off the weird animal life

The battle sequences with the fauna are arcade-like rather than relying on the traditional hit point system Three objects may be carried by you and it is up to you to decide which will be most useful in your quest Occasionally you are allowed a short glimpse of a plan of the level you are currently on but this option is a luxury and not to be used lightly An enthralling and addictive program

Several books are now available for the Spectrum programmer and some of these also offer tapes to save tired fingers the drudgery of typing The *Spectrum Pocket Book*, by Trevor Toms and published by Phipps Associates, is one such book, and is the latest in a series of extremely good volumes for the whole Sinclair range and the Atom The first part of the latest book concentrates on games, the listings of which are fully annotated Thus you can apply the techniques used in the programs to you own efforts

The second part of the book introduces you, very gently, to machine code programming Tapes are available for both sections one containing the games *(Great Fire of London, Castle Walls, Reversi* and so on), and the other all the Machine Code routines — Assembler Disassembler, Monitor and Screen Tool Kit. The games are all original, and good fun to play The machine code section itself is worth the



price of the book

If you are prepared to type in the lengthy programs yourself you need never buy another expensive piece of software to help you program in machine code but Phippe s own tape is extremely good value, and highly recommended to anyone at all interested in this branch of programming A word of warning however instructions for using the tapes are contained within the text of the book so you will need to invest in both tape and book to gain the full advantage

The second educational tape in this current survey comes from Calpac *Junior Education* contains eight programs for the 6 to 11 age group Subjects covered include mathematics *(Tables)*, spelling *(Homophones)*, and history *(Romans)* All are supported by charming animated graphics, and good colours and sound Just what kids like, in fact, but here they are not talked down to A varied and worthwhile selection of programs recommended for home education

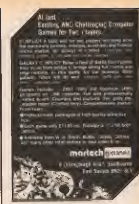
Finally, a tape that I have to admit I cannot approach objectively — *Popular Computing Weekly's* own collection of favourite programs from its pages There are four games here two for the ZX81 and two for the 16K Spectrum — *Laser Chase* and *Kong s Revenge* The former is a rarity, a two player game — a sort of surround with bombs — which should appeal to the sadists among you The object, of course, is to fence in your opponent

Kong s Revenge is, as you may have guessed a version of the arcade game in which you have to guide your little man up the ladders, while Kong throws barrels down at you (why he doesn t jump down and give you a friendly little squeeze is not explained!) Along the way you may pick up parasols conveniently dotted around, thus gaining more points The first level is hard and subsequent levels are near impossible for me to negotiate The game is extremely addictive, and a great favourite with the kids who seem to play with their eyes shut!

Firm	Program	Cost
Hewson Consultants 60A St Mary s Street Wallingford Oxon OX10 0EL	*Night Flight*	[illegible]
Hilton Computer Services 14 Avalon Road Orpington Kent BR6 9AX	*Personal Banking System*	[illegible]
Artic 396 James Reckitt Avenue Hull North Humberside HU8 0JA	*Planet of Death*	£6.95
Mine of Information 1 Francis Avenue St Albans Herts AL3 6BL	*Reversi*	[illegible]
Phipps Associates 99 East Street Epsom Surrey KT17 1EA	*Machine code tools*	[illegible]
Cleva Computer Ware 34 The Avenue Loughton Essex	*ZXTrek*	
Haven Hardware 4 Asby Road Asby Workington Cumbria	*Fruit Machine* *Patience*	[illegible] £5.95
Tasman Software 17 Hartley Crescent Leeds LS6 2LL	*Tasmeq*	[illegible]
DPM Software 641 Morrow Way Bettws, Newport	*Biorhythms* *Plane Attack* *Solitaire*	

Summary

It is obvious that the software writers have grown up along with the Spectrum — it is no longer enough to simply shove out another *Space Invader* program While the old favourites still have their place, companies like Imagine are showing us that there are now arcade games to become addicted to and of a higher quality than ever before On the "serious side, too, the Spectrum has a lot to offer, and is being well served by most of the companies in this survey ■



At last
Exciting AND Challenging Computer
Games for Two Players
martech



ZX81 Spectrum
MANAGEMENT GAMES
DALLAS
NEW!
A game of oil exploration and exploitation in Texas. Decisions are required on purchasing concessions, the movement and use of drilling rigs, and the building of platforms and pipelines. Can you take-over the Ewing Empire, or will you be taken-over in the attempt
FARMER
NEW!
Is a simulation of running a large wheat farm. Decisions are required on when to plant, irrigate, fertilize, spray and harvest your land and whether to purchase, loan, rent, land or farm machinery or whether to employ more farm workers
MODELLER X Business Model
This is a user friendly business modeller which provides Managers with a tool to plan the strategic decisions of a business. The model shows the profit sensitivity and the interaction of the pertinent marketing and production factors of a business. A user manual is included in the price of the program
PRICES
ZX81 or SPECTRUM 16k 48K
Dallas and Farmer £5 £6
Modeller X £8 £9
DEDUCT £1.50 for two £3 for three
C.C.S.
DEPT P C
CASES COMPUTER SIMULATIONS
14 Langton Way
London SE3 7TL

OPEN FORUM

Open Forum is for you to publish your programs and ideas. Take care that the listings you send in are all bug-free. Your documentation should start with a general description of the program and what it does and then give some detail of how the program is constructed. We will pay the _Program of the Week_ double our new fee of £6 for each program published

Fill

on Spectrum

This routine is a useful utility which enables any Spectrum owner to fill the screen with a solid block of colour. All you need to do to get a shape on the screen is *Poke* the stated addresses with the required data and then LET L = USR 32000. The screen will be filled (or part of it).

An example is given in the listing which will produce a green block starting at 100, 100 and ending at 150, 150.

The program is very simple as all it does is call the Rom plot routine (at 8933) repeatedly, until the specified dimensions are encountered, whereby it returns to Basic.

Alternatively, the routine can be called from a machine code program. The data will be directly *Poked*, instead of using the loop. The colour requirements are fed into the machine using *Rst* 16 (in the first 6 bytes).

Fill routine
Poke 32004 n = the ink colour of the shape.
Poke 32007 n = the x co-ordinate of the bottom of the shape
Poke 32008 n = the y co-ordinate of the bottom of the shape
Poke 32010 n = the x co-ordinate of the top of the shape
Poke 32011, n = the y co-ordinate of the top of the shape E.G.
For a green shape with bottom co-ordinates at 100 100 and top co-ordinates at 150 150

```
Poke 32004 4
     32007 100
     32008 100
     32010 150
     32011 150
```

Then LET L = USR 32000, and the shape will appear.

The machine code is

Address	Number
32000	62
32001	16
32002	215
32003	62
32004	4
32005	215
32006	1
32007	100
32008	100
32009	17
32010	150
32011	150
32012	122
32013	144
32014	185
32015	123
32016	166
32017	111
32018	320
32019	197
32020	197
32021	245
32022	205
32023	329
32024	34
32025	241
32026	183
32027	12
32028	61
32029	32
32030	245
32031	193
32032	115
32033	128
32034	4
32035	37
32036	32
32027	230
32038	201

The machine code can be loaded using

```
10 FOR a=32000 TO 32038: INPUT x: POKE a,x
PRINT a,x: Next a
```

by M Skinner

Assembler

on BBC Micro

This program for the BBC Micro Model A or B assembles a short machine code routine into &D00 to &D34 which retrieves as much as possible of your Basic program after a "Bad program" error caused by accidentally *Poking* into the Basic program area or by a program which has not loaded correctly. Retrieve works wherever the program is in memory by looking at the value of *Page*.

So that Retrieve is ready for use when required type in the program as shown, *Run* it and then save a machine code version by *SAVE "Retrieve" D00 D35. When you wish to use it type *RUN and play the tape.

To use Retrieve to correct a program not saved on cassette correctly use the *OPT 2,0 command (see new *User Guide*, p 398) which loads the program complete with errors and then *RUN Retrieve. In this way the greater part of a program which has block 0 missing due to the fault in the cassette filing system can be retrieved.

Program notes

30	Allows two passes of the assembler which is needed for forward branches
40	Sets start of machine code to &D00
50-90	Copies the value of *Page* into &70 &71
100-110	Load *Page* with &0D for start of line
120-160	Returns to Basic if end of Basic program found
170-230	Finds the length of the current Basic line
240-260	Adds end of program marker
270-280	Returns to Basic
290-320	Puts length of line in correct location
330-380	Sets &70 &71 to start of next line

```
>
10 REM ******** Retreive ********
20 REM *** (C) Neil Odell 1983 ***
30 FOR PASS=0 TO 3 STEP 3
40 P%=&D00
50 [OPT PASS
60 LDA&18
70 STA&71
80 LDY#0
90 STY&70
100 LDA#&D
110 STA(&70),Y
120 .LOOP1
130 LDY#1
140 LDA(&70),Y
150 CMP#&FF
160 BEQ FINISH
170 LDY#4
180 .LOOP2
190 LDA(&70),Y
200 CMP#&D
210 BEQ PUTBYTE
220 INY
230 BNE LOOP2
240 LDA#&FF
250 INY
260 STA(&70),Y
270 .FINISH
280 RTS
290 .PUTBYTE
300 TYA
310 LDY#3
320 STA(&70),Y
330 CLC
340 ADC&70
350 STA&70
360 BCC LOOP1
370 INC&71
380 BCS LOOP1
390 ]
400 NEXT
```

Assembler *by Neil Odell*

Peeke end Pokes

on Dragon

PROGRAM 1
AUTOREPEAT KEYS

I think this may be the answer Peter Chase was looking for (ref page 25, vol 1, no 36) Line 20 indicates if a key is pressed, whilst line 30 prints the character pressed It is line 40 which allows the second repeating key to function before the first is released The reason for this becomes clear in program 2

PROGRAM 2
PEEK (337) to PEEK (345)

In order to fully explore these *Peeks* it is best to take them one by one modifying line 30 each time Run the program and make a table of the *Peeked* values for each key You will find for example that when *Peek* (337) = *Peek* (339) the 'A key is pressed

PROGRAM 3
SCREEN POKEs

It is possible by *Poking* direct to the text screen memory to obtain inverted characters not available by printing *Chr$* codes or direct from the keyboard Run program 3 and the top half of the screen will be the *Chr$* characters whilst the bottom half will be the *Poked* characters Notice the extra line in the bottom half? Make a note of the *Poke* codes as some of these differ from the *Chr$* codes

PROGRAM 1

```
10 CLS
20 IF PEEK (337) = 255 THEN 20
30 PRINT CHR$ (PEEK (135))
40 POKE 337 101
50 GOTO 20
```

PROGRAM 2

```
10 CLS
20 K$ = INKEY$ IF K$ = "" THEN 20
30 PRINT K$ PEEK (337)
40 GOTO 20
```

PROGRAM 3

```
10 CLS
20 FOR N = 0 TO 255
30 PRINT CHR$(N) NEXT
40 C = 0 FOR P = 1280 TO 1538
50 POKE P C
60 C = C + 1 IF C > 255 THEN C = 0
70 NEXT
80 GOTO 80
```

by Brian Beesley

Earth Attack

on Vic20

The controls are
CRSR UP which moves the base to the left
CRSR RIGHT which moves the base to the right
The space bar is used to fire

20 to 30	Read data characters
90 to 94	Print Mother Ship
140 to 200	Define the Invaders
210 to 220	Position of Invaders
260 to 284	Check for movement of base
280	Check for missile
310 to 311	Draw missile and check for hit
330 to 350	Check if Invaders land
510 to 520	Destroy Invader
800 to 730	Winning display
800 to 860	Title set-up
1000 to —	Losing display

```
1 GOTO800
5 POKE 36878,15
10 PRINT"♥ ,
20 A=7160 B=7175 FORT=1TO6
30 FORAA=ATOB READS POKEAA,S NEXT A=A+8 B=B+8 NEXT
40 DATA129,66,60,126,219,255,126,129
50 DATA16,16,56,124,124,254,254,254
60 DATA16,16,16,0,0,0,0,0
70 DATA146,84,0,198,0,84,146,0
80 DATA0,0,0,0,0,0,0,0
85 DATA255,255,255,255,255,255,255,255
90 POKE36869 255
92 PRINT"EEEEEEE[illegible]EEEEEEE",
93 PRINT"      !              ! "
94 PRINT"      +              + ",
100 S=30720
110 D=8174
120 Y=7780
130 Z=0
140 FORI=1TO3 X(I)=0 NEXT
200 W=0 P=0
210 FORI=1TO3
220 POKEY+W-1,4 POKEY+W,X(I) POKEY+W+S,5 W=W+14 NEXT
222 POKE36874 128
230 Y=Y+1
260 GETA$
270 IFA$="W"THEND=D-1 POKED+1 4
280 IFA$="M"THEND=D+1 POKED-1 4
295 POKE36874,0
290 POKED,1 POKED+S,0
300 IFZ=0ANDA$=" "THENPOKE36876,140
    R=D-22 Z=1 POKE36876,0
310 IFZ=1THENPOKER+22 4 POKER 2 POKER+S,2
311 FORI=1TO3 IFZ=1ANDR-2 =Y+PTHENGOSUB500
312 P=P+14
313 NEXT
319 R=R-22
320 IFZ=1ANDR<=7746THENPOKER+22,4 Z=0
330 IFX(1)=0ANDY>8185THEN1000
340 IFX(2)=0ANDY+14>8185THEN1000
350 IFX(3)=0ANDY+28>8185THEN1000
400 GOTO200
500 IFX(I)=4THENRETURN
510 POKE36877,222 POKER-22,3 POKE36877,0
    POKER-22,4 X(I)=4
515 IFX(1)=4ANDX(2)=4ANDX(3)=4THEN600
520 RETURN
600 FORY=140TO222 FORT=1TO12 POKE36875,
    Y+T NEXT NEXT
710 FORY=15TO0STEP-1 POKE36877,220 POKE
    36878,Y FORT=1TO200 NEXT
720 PRINT"
730 NEXT
800 POKE36869 240 PRINT"♥"
805 POKE36877 0 POKE36875,0
810 PRINT"EARTH ATTACK"
820 PRINT"    CRSR UP-LEFT"
830 PRINT"    CRSR LEFT-RIGHT"
840 PRINT"    SPACE BAR TO FIRE"
850 PRINT"       HIT A KEY"
860 GETA$ IFA$=""THEN860
870 FORT=220TO140STEP-1 POKE36874,T
    POKE36876 T NEXT
880 POKE36876,0 POKE36874,0 RESTORE GOTO5
1000 FORY=1TO5
1010 FORR=240TO140STEP-1 POKE36874,R NEXT
     NEXT POKE36874,0 GOTO800

READY.
```

Earth Attack
by Emile Wakefield

Bounce

on Vic20

The object of the game is to get the ball to the bottom right hand corner rebounding off bricks bats etc watching out for the stars which will make the ball appear in a different place The best time achieved is 8 seconds — try to beat it The game uses the Vic sound and colour capabilities well

Variables

X	For next loops
Z	Peek (197)
HS	High Score
NA$	Name
A	Position of ball
B	Movement of ball
AA	Bat Position
BB	Bat Movement
T	VAL (TI$)
AC	Star Position

PROGRAM OF THE WEEK

```
0 PRINTCHR$(8) POKE36879,15 NA$="NOBODY"
10 REM############
15 REM           #
20 REM  BOUNCE   #
25 REM           #
30 REM    BY     #
35 REM           #
40 REM  STEVEN   #
45 REM           #
50 REM CRANSHAW  #
55 REM           #
60 REM############
65 GOSUB440
70 HS=99
75 POKE36879,25 PRINT"J"
80 FORX=7680TO7701
85 POKEX+30720 2
90 POKEX 160
95 POKEX+484+30720 2
100 POKEX+484 160
105 NEXT
110 FORX=7680TO8185STEP22
115 POKEX+30720 2
120 POKEX 160
125 POKEX+30741 2
130 POKEX+21 160
135 NEXT X
140 FORX=1TO120
145 B=RND(-TI) B=INT(RND(1)*506)+7680 IFPEEK
    (B)=160THEN145
150 POKEB+30720 6
155 POKEB 160
160 NEXTX
165 FORX=7703TO7706
170 POKEX 32
175 POKEX+22 32
180 POKEX+44 32
185 NEXTX
190 FORX=8159TO8162
195 POKEX 32
200 POKEX-22,32
205 POKEX-44 32 NEXT
210 FORX=8094TO8096
215 POKEX+30720 0
220 POKEX 160
225 NEXT
230 POKE8162,87 POKE38882,6
235 A=7703 B=1 TI$="000000" AA=8116 BB=22
240 PRINT"### TIME",VAL(TI$),TAB(10)"#BEST
    TIME"HS
245 PRINT"######################### NAME ",
    NA$,
250 IFPEEK(A+B)>128ORPEEK(A+B)=92THENB=-B
    POKE36876 220 POKE36876 0
255 IFPEEK(A+B)=42THENGOSUB635
260 IFPEEK(A+B)<>160THENA=A+B IFPEEK(A-B)=81
    THENPOKEA-B 32
265 IFPEEK(A+B)>128ORPEEK(A+B)=92THENB=-B
    POKE36876 230 POKE36876 0
270 POKEA+30720 3
275 POKEA 81
280 Z=PEEK(197) IFZ=64THEN305
285 IFZ=39ANDPEEK(A-22)<>160THENB=-22 GOTO310
290 IFZ=47ANDPEEK(A-1)<>160THENB=-1 GOTO310
295 IFZ=63ANDPEEK(A+23)<>160THENB=23
300 IFZ=55ANDPEEK(A-21)<>160THENB=-21
    GOTO310
305 IFINT(RND(1)*100)=<3ANDF<2THENF=F+1
    GOSUB615
310 IFA=8162THENGOTO345
315 IFPEEK(AA-BB)<>160THENPOKEAA-BB 32
320 POKEAA+30720 4
325 POKEAA 92
330 IFPEEK(AA+BB)=160THENBB=-BB
335 AA=AA+BB
340 GOTO240
345 T=VAL(TI$) FORX=1TO12
350 READB,C
355 POKE36876 B
360 FORW=1TOC
365 NEXTW
370 POKE36875 0
375 NEXTX
380 DATA214 70 200,70,192,170,195 170,180,
    70 200 70 205 70 255,70
385 DATA214 170 214 170 214,250 200 220
390 PRINTCHR$(14) POKE198,0
395 PRINT"#IME " T PRINT
400 IFHS>TTHENHS=T GOSUB590
405 PRINT"#EST TIME " HS PRINT
410 PRINT"#AME " NA$ PRINT
415 PRINT"#ERUN ## # (_ ##"
420 GETA$
425 IFA$="Y"THENRESTORE PRINTCHR$(142)
    POKE36879 15 GOTO75
430 IFA$="N"THENPOKE37154 255 PRINT"#" POKE
    36879 27 PRINTCHR$(142) END
435 GOTO420
440 REM INSTRUCTIONS
445 POKE36879 8 PRINT"#INSTRUCTIONS"
450 GETA$ IFA$="N"THEN70
455 IFA$="Y"THEN465
460 GOTO450
465 PRINT"J", POKE36879,59 A$(1)="
    #BOUNCE ##"
470 A$(2)="↑ F1 UP"
475 A$(3)="↑ F3 RIGHT"
480 A$(4)="↑ F5 DIAGONAL DOWN"
485 A$(5)="↑ F7 DIAGONAL UP"
490 A$(6)="#THE OBJECT IS TO REACHTHE
    CIRCLE IN THE"
495 A$(7)="LEAST TIME POSSIBLE "
500 A$(8)="#REBOUNDING OFF BLOCKS ETC.
    WATCH OUT FOR THE"
505 A$(9)="#STARS (BLACK HOLES)"
510 FORX=1TO9
515 FORXX=1TOLEN(A$(X))
520 IFMID$(A$(X),XX,1)="↑"THENPRINT XX=XX+1
525 IFMID$(A$(X),XX+1,1)=" "THENGOTO535
530 POKE36876 220 POKE36876 0
535 PRINTMID$(A$(X),XX,1);
540 FORX=1TO50 NEXTX
545 NEXTXX
550 PRINT NEXTX
555 PRINT"#####################################HIT
    SPACE#"
560 GETB$ IFB$=" "THEN585
565 FORX=1TO200 NEXTX
570 PRINT"#####################################HIT
    SPACE"
575 FORX=1TO200 NEXTX
580 GOTO555
585 PRINT"J" RETURN
590 PRINT"#WELL "ONE YOU #CORED    IME #EST
    IME #NPUT #OUR #AME
595 GETNA$ IFNA$=""THEN595
600 INPUTNA$
605 PRINT
610 RETURN
615 AB=INT(RND(1)*470)+7680
620 IFPEEK(AB)=160THEN615
625 POKEAB 42 POKEAB+30720 5 POKE36876 220
    POKE36876,0
630 RETURN
635 AC=INT(RND(1)*450)+7680
640 IFPEEK(AC)>128THEN635
645 POKEA+B 32 POKEA 32 A=AC F=0 B=-B
650 POKE36875 240 POKE36875 0
655 RETURN

READY
```

Bounce

by Stephen Cranshaw


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Screen-copying

on Spectrum

The Spectrum manual states that you can't *Peek* or *Poke* the screen. Well, you can and this short demonstration program shows this, by copying the top third of the screen to the middle third. Whilst not very inspiring in itself, this should give you enough of a clue to a routine that will *Peek* any *Print* position and return the true character value, which of coures, *Screen$* will not do.

Enter the short program and put anything you like in the *Print* line 10. *Run* will copy the top third to the middle and erase the top as it does so. You will see that the screen is built in the same manner as loading the screen area (when a screen—save has been made). This should provide enough clues also as to which bytes to *Peek* or *Poke*. An example would be to copy anything on a given line to another or to build the true *Screen$* value of a graphic character. Another example might be mirror-imaging of lines or individual characters.

Screen Copying
by Paul Newman

```
   1 REM SCREEN COPYING - BY POK
ING THE DISPLAY FILE.
   2 REM
  10 PRINT "This is just to fill
 up the screen with lots and lot
s of pretty writing.We are going
 to copy this to the middle thir
d of the screen.This illustrates
 that you can POKE the screen.wi
th care."
  50 FOR J=2048 TO 4095
  60 POKE (16384+J),PEEK (16384+
(J-2048))
  65 POKE (16384+(J-2048)),0
  70 NEXT J
  80 PRINT AT 20,10;"OK"
```

Replace$

on ZX81

Replace$ is a machine code routine which can be very useful in games programs. Every time the character stored at address 16526 is found in the Display File it is replaced by the character stored at address 16530. This routine may be adopted when one wishes to obtain such special effects as making a pacman ghost or an alien space ship flicker from inverse to normal without affecting the rest of the Display File or on any occasion when specific characters in the Display File need to be changed.

To use this routine, enter and run program 1. Now delete all except line 1 and enter program 2 (which is a subroutine to run the machine code).

The variable A should contain the character code of the characters to be replaced. The variable B should contain the replacement character.

Program 1

```
 1 REM (23 M s)
10 LET P=16514
20 LET A$= "0618 2A0C40 23 7E BF76 2809 BF00 20F6 3E00 77 18F1 10EF C9"
30 POKE P 16 CODE A$+CODE A$(2)-476
40 LET P=P+1
50 LET A$=A$(3 TO)
60 IF A$="" THEN STOP
70 GOTO 30
```

Program 2

```
9000 POKE 16526,A
9010 POKE 16530,B
9020 RAND USR 16514
9030 RETURN
```

A contains character code of characters to be replaced
B contains character code of replacement character

Address	Hex code	Instruction	Basic
16514	0618	LD B 24	LET B=24 (number of lines of screen)
16516	2A0C40	LD HL,(16396)	LET HL=PEEK 16396 (HL=start of DISPLAY FILE)
16519	23	INC HL	LET HL=HL+1 (first character in DISPLAY FILE)
16520	7E	LD A,(HL)	LET A=PEEK HL (A=character code stored at HL)
16521	BF76	CP A 118	LET A=A-118 (answer not stored anywhere and value of A is not affected)
16523	2809	JRZ 09	IF (value calculated by last instruction)=0 THEN GOTO 16534
16525	BF00	CP A,00	LET A=A-00 (answer not stored anywhere and value of A is not affected) Address 16526 contains the character code of the character to be replaced
16527	20F6	JRNZ-10	IF (value calculated by last instruction)<>0 THEN GOTO 16519 (goto next character if not character to be replaced)
16529	3E00	LD A,00	LET A=0 (LET A=replacement character) Address 16530 contains the character code of replacement character
16531	77	LD (HL) A	POKE HL A (replace character)
16532	18F1	JR-15	GOTO 16519 (goto next character)
16534	10EF	DJNZ-17	IF B<>0 THEN LET B=B-1 and goto 16519 (if not at end of DISPLAY FILE then let lines=lines-1 and goto next character)
16536	C9	RET	RETURN

by John Hodgson

Asteroids

on ZX81

The object of this game is to travel as far as you can in your space ship dodging the asteroids as much as you can. You have laser cannons to help you.

You also have the option of hyperspacing twice, but this loses you 50 points. You can also travel at the speed of the asteroids for as long as you like but your score will go down rapidly.

When you finally crash the computer will tell you how well you did. There is a high score table.

The controls are

4 fast left
5 slow left
8 slow right
9 fast right
1 fire
h hyperspace

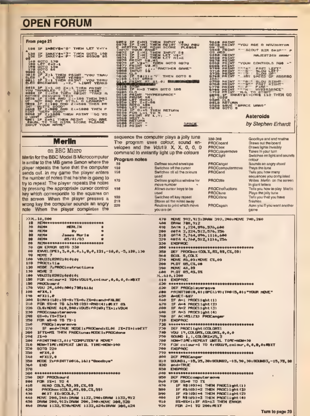
Program notes

1 5	Set up variables
6-8	Ask if instructions are needed
10-30	Set up variables
40-50	Print asteroids
40-50	Check screen and add up score
90-140	Check if key pressed
150-160	Slow up routine
170	Goto 40
9000-9130	Crash routine and comments
9200-9300	Hyperspace routine
9500-9550	Firing routine
9800-9890	Instructions
9820-9830	Save routine

The program must have been run before the *Save* routine can be used or the variable undefined error code will appear on reloading.

```
   1 LET HI=0
   2 LET U$=""
   5 LET G=0
   6 PRINT "INSTRUCTIONS?"
   7 INPUT A$
   8 IF A$(1)="Y" THEN GOSUB 980
0
  10 LET A$="V"
  11 LET H=0
  15 LET Z=0
  20 LET X=0
  30 LET Y=15
  40 PRINT AT 20,RND*28,"****"
  50 PRINT AT X,Y
  60 IF PEEK (PEEK 16398+256*PEE
K 16399)=23 THEN GOTO 9000
  65 PRINT AT X,Y;A$
  70 LET Z=Z+1
  80 SCROLL
  90 IF INKEY$="H" THEN GOTO 920
0
 100 LET Y=Y-(INKEY$="5")+(INKEY
$="8")
 110 IF INKEY$="4" THEN LET Y=Y-
4
```

Turn to page 23



From page 21

```
100 IF INKEY$="6" THEN LET Y=Y+
4
130 IF INKEY$="7" THEN GOTO 100
135 IF INKEY$="F" THEN GOSUB 85
00
140 GOTO 170
160 LET Z=Z-1
160 GOTO 100
170 GOTO 60
9000 CLS
9010 IF Z>1 THEN PRINT "YOU TRAV
ELED ",Z," LIGHT YEARS"
9011 IF Z<1 THEN PRINT "YOU TRAV
ELED BACKWARDS ",-Z," LIGHT YEARS
"
9015 IF Z=1 OR Z=-1 THEN PRINT "
YOU TRAVELED ",Z," LIGHT YEAR"
9020 IF Z<=50 THEN PRINT "TAKE A
NOTHER DRIVING TEST"
9030 IF Z>50 AND Z<=100 THEN PRI
NT "NOT BAD BUT STILL A LEARNER"
9040 IF Z>100 AND Z<=500 THEN PR
INT "QUITE GOOD"
9050 IF Z>500 AND Z<=1000 THEN P
RINT "VERY GOOD"
9060 IF Z>1000 THEN PRINT "DO YO
U WANT JOB"
9061 IF Z=HI THEN PRINT "YOU ARE
 EQUAL TO THE HIGH SCORE PLEASE
INPUT YOUR NAME"
9070 IF Z>HI THEN PRINT "YOU HAV
E BEATEN THE HIGH SCORE  PLEASE
INPUT YOUR NAME"
9072 IF Z>HI THEN INPUT D$
9073 IF Z>HI THEN LET U$=""
9074 IF Z>HI THEN LET HI=Z
9075 PRINT U$,HI
9076 IF V$="" THEN GOTO 9079
9077 PRINT V$,HI
9079 PRINT ;;,"ANOTHER GAME"
9080 INPUT S$
9085 CLS
9090 IF S$(1)="Y" THEN GOTO 5
9100 LIST 8000
9110 PRINT AT 21,0; [redacted]
"
9120 STOP
9200 IF H=2 THEN GOTO 100
9205 CLS
9210 PRINT "HYPERSPACE"
9220 PAUSE 50
9230 LET H=H+1
9235 LET Z=Z-50
9300 GOTO 100
9500 LET O=O+1
9510 IF O>5 THEN RETURN
9520 FOR L=1 TO 5
9530 PRINT AT L,Y; "
9540 NEXT L
9550 RETURN
9600 PRINT "                SPACE
9610 PRINT "
9630 PRINT "YOU ARE A NAVIGATOR
ON THE
9640 PRINT " SCOUT AIR SHIP " F
OR HER
9660 PRINT "       MAJESTIES ARMY"
9660 PRINT
9670 PRINT
9690 PRINT "YOUR CONTROLS ARE -"
9690 PRINT
9700 PRINT ""4"  FAST LEFT"
9710 PRINT ""5"  SLOW LEFT"
9730 PRINT ""7"  SLOW UP"
9740 PRINT " (AT SPEED OF ASSERO
IDS)"
9750 PRINT ""8"  SLOW RIGHT"
9760 PRINT ""9"  FAST RIGHT"
9770 PRINT ""F"  FIRE"
9780 PRINT ""H"  HYPERSPACE"
9790 PRINT "N/L TO START"
9800 IF INKEY$<>CHR$ 118 THEN GO
TO 9800
9805 CLS
9810 RETURN
9920 SAVE "SPACE WARS"
9930 GOTO 8
```

Asteroids

by Stephen Erhardt

Merlin

on BBC Micro

Merlin for the BBC Model B Microcomputer is similar to the MB game Simon where the player repeats the tune that the computer sends out. In my game the player enters the number of notes that he/she is going to try to repeat. The player repeats the notes by pressing the appropriate cursor control key which corresponds to the squares on the screen. When the player presses a wrong key the computer sounds an angry note. When the player completes the sequence the computer plays a jolly tune. The program uses colour, sound envelopes and the *Vdu19*, X, X, 0, 0, 0 command to instantly light up the colours.

Program notes

80	Defines sound envelope
100	Switches off the cursor
150	Switches off all the colours used
170	Defines graphics window for move number
180	Allows cursor keys to be used
190	Switches off key repeat
210	Stores all the notes away
220	Routine to print which move you are on
330-360	Goodbye and end routine
PROCboard	Draws out the board
PROCbox	Draws lights invisibly
PROCplayermove	Takes in your turn
PROClight	Switches on light and sounds colour
PROCanger	Sounds an angry shout
PROCcomputermove	Plays the tune
PROCend	Tells you how many sequences you completed
PROCtitle	Writes Merlin on the screen in giant letters
PROCinstructions	Tells you how to play Merlin
PROCtune	Plays the jolly tune
PROCdone	Tells you that you have finished
PROCagain	Asks you if you want another game

```
>>L.10,800
 10 REM***************************
 20 REM*          MERLIN         *
 30 REM*            By           *
 40 REM*       James Murle       *
 50 REM*        05/01/83         *
 60 REM***************************
 70 ON ERROR GOTO 330
 80 ENVELOPE1,3,0,0,0,1,0,0,121,-10,0,-5,120,130
 90 MODE 7
100 VDU23;8202;0;0;0;
110 PROCtitle
120 MODE 7:PROCinstructions
130 MODE 2
140 VDU23;8202;0;0;0;
150 FOR colour=1 TO4:VDU19,colour,0,0,0,0:NEXT
160 PROCboard
170 VDU 24,600;500;700;616;
180 *FX4,1
190 *FX11,0
200 DIMA$(50):S$=0:T%=0:Z%=0:end=FALSE
210 FOR S%=0 TO 63:A$(S%)=RND(4):NEXT S%
220 CLG:MOVE 610,540:VDU5:PRINT;T%+1:VDU4
230 PROCcomputermove
240 G%=0:T%=T%+1
250 FOR W%=0 TO T%-1
260   PROCplayermove
270   IF end=TRUE MODE1:PROCend:ELSE Z%=Z%+1:NEXT
280 IFT%=M% THEN PROCtune:MODE1:PROCdone
290 Z%=0
300 PRINTTAB(3,0);"COMPUTER'S MOVE"
310 NOW=TIME:REPEAT UNTIL TIME=NOW+100
320 GOTO 220
330  *FX4,0
340  *FX12,0
350 MODE 2:PRINTTAB(6,16);"Goodbye"
360  END
370
380 *************************************
390 DEF PROCboard
400 FOR I%=1 TO 4
410   READ COL%,A%,B%,C%,D%
420   PROCbox(COL%,A%,B%,C%,D%)
430   NEXT I%:GCOL0,7
440 MOVE 200,240:DRAW 1132,240:DRAW 1132,912
450 DRAW 200,912:DRAW 200,240:MOVE 200,528
460 DRAW 1132,528:MOVE 1132,624:DRAW 200,624
470 MOVE 592,912:DRAW 592,240:MOVE 740,240
480 DRAW 740,912
490 DATA 1,224,896,576,600
500 DATA 2,224,512,576,256
510 DATA 3,764,896,1116,600
520 DATA 4,764,512,1116,256
530 ENDPROC
540 *************************************
550 DEF PROCbox(COL%,A%,B%,C%,D%)
560 GCOL 0,COL%
570 MOVE A%,B%:MOVE C%,B%
580 PLOT 85,C%,D%
590 MOVE A%,D%
600 PLOT 85,A%,D%
>L.610,1200
610 ENDPROC
620 *************************************
630 DEF PROCplayermove
640 PRINTTAB(0,0);SPC(19);TAB(5,0);"YOUR MOVE"
650 A=GET-&87
660 IF A=1 PROClight(1)
670 IF A=4 PROClight(2)
680 IF A=2 PROClight(3)
690 IF A=3 PROClight(4)
700 IF A<>A%(Z%) PROCanger
710 ENDPROC
720 *************************************
730 DEF PROClight(COLOR%)
740 VDU 19,COLOR%,COLOR%,0,0,0
750 SOUND 1,1,COLOR%*25,3
760 NOW=TIME:REPEAT UNTIL TIME=NOW+30
770 FOR colour=1 TO 4:VDU19,colour,0,0,0,0:NEXT
780 ENDPROC
790 *************************************
800 DEF PROCanger
810 SOUND1,-15,25,30:SOUND2,-15,50,30:SOUND3,-15,75,30
820 end=TRUE
830 ENDPROC
840 *************************************
850 DEF PROCcomputermove
860 FOR D%=0 TO T%
870   IF A$(D%)=1 THEN PROClight(1)
880   IF A$(D%)=2 THEN PROClight(3)
890   IF A$(D%)=4 THEN PROClight(2)
900   IF A$(D%)=3 THEN PROClight(4)
910   B%=B%+1:IF A%=63 THEN ERROR
920   FOR J=1 TO 200:NEXT
```

Turn to page 29



DRAGON OWNERS
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..the name of the game


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..the name of the game
Imagine Software, Masons Buildings, Exchange Street East, Liverpool, Merseyside L2 3PN Telephone 051-236 0407

From page 23

```
1050  VDU 31,0,11,147,154,255,255,100,100,255,50,160,255,255,96,203,96,165,34
1060  VDU 255,35,96,107,125,32,107,255,32,32,32,34,255,33,32,107,255,116,32,107
1070  VDU 255,33,31,12,22,134,91,32,66,249,32,74,66,77,111,114,106,101,32,221
1080  VDU 31,0,12,147,150,104,255,32,32,255,33,32,106,255,96,47,32,66,32,255,50
1090  VDU 43,255,49,32,106,255,32,32,06,32,255,101,32,104,255,34,109,132,255
1100  VDU 32,31,0,13,147,154,96,96,33,34,96,96,37,96,96,96,96,96,33,34,96,96,32
1110  VDU 34,96,32,96,96,96,96,33,34,96,96,32,96,96,33,32,96,96,33,10
1120  PRINTTAB(0,20);CHR$147:PRINTTAB(0,3);CHR$147
1130  FOR L=1 TO 29:PRINTTAB(L,3);CHR$240:PRINTTAB(L,30);CHR$96:NEXT
1140  FOR YELL=16 TO 19:PRINTTAB(0,YELL);CHR$147;CHR$255;SPC(37);CHR$255:NEXT
1150  FOR YELL=4 TO 7:PRINTTAB(0,YELL);CHR$147;CHR$255;SPC(37);CHR$255:NEXT
1160  WAIT=INKEY(500)
1170  ENDPROC
1180 ************************************
1190  DEF PROCinstructions
1200  FOR TITLE=1 TO 2:PRINTTAB(12,TITLE);CHR$(157);CHR$(129);CHR$(141);"MERLIN
  ";CHR$(156):NEXT

>L.1210,
 1210  PRINTTAB(0,5);"     This is a simple little
   game"
 1220  PRINT'"where the computer plays a series"
 1230  PRINT'"of notes and you the player has to"
 1240  PRINT'"match them up. As the game progresses"
 1250  PRINT'"the computer builds up the tune to a"
 1260  PRINT'"maximum of 80 notes."
 1270  PRINT'"      The notes are displayed as "
 1280  PRINT'"coloured squares on the screen which"
 1290  PRINT'"are arranged in a square which"
 1300  PRINT'"correspond to the cursor keys."
 1310  WAIT=INKEY(1500):CLS
 1320  PRINTTAB(5,13);"How many notes will you
   try ? ";
 1330   PRINTTAB(12,16);SPC(40)TAB(12,16);"Enter 1
   to 80 ";:INPUT A%:IF M%<1 OR
M%>64 THEN 1320
 1340  ENDPROC
 1350 ************************************
 1360  DEF PROCtune
 1370  RESTORE 1420
 1380  FOR TUNE=1 TO 12
 1390    READ pitch%,length%
 1400    SOUND &0001,-15,pitch%,length%
 1410    NEXT
 1420  DATA 129,5,101,5,117,5,129,5,149,5,137,5,
   129,10,101,5,117,5,129,5,165,5,1
   57,10
 1430  ENDPROC
 1440 ************************************
 1450  DEF PROCdone
 1460  VDU19,0,4,0,0,0
 1470  PRINTTAB(12,10);"CONGRATULATIONS'"
 1480  PRINTTAB(2,16);"You have completed your
       sequence"
 1490  PRINTTAB(11,17);"of ";T%;" notes."
 1500  PROCagain
 1510  ENDPROC
 1520 ************************************
 1530  DEF PROCagain
 1540  PRINTTAB(6,25);"Another Game (Y/N) ?";
 1550  G$=GET$:IF G$="Y" THEN CLEAR:GOTO 130
 1560   PRINTTAB(3,27);"Do you want to start a new
        game"
 1570   PRINTTAB(3,30);"or do you want to finish
        (S/F)? ";:ZX$=GET$
 1580   IF ZX$="S" CLEAR:RUN:ELSE GOTO 330
 1590  ENDPROC
 1600 ************************************
```

Merlin
by James Morle

3-D Mountain

on Dragon

3-Dee Mountain is a short listing but the result is a graphic picture as seen on big computers

It runs on either the TRS-80 Color Computer or the Dragon 32

If your computer can handle it then *Poke* 65495 0 to speed up the plotting but remember to slow it down with *Poke* 65494 0 before using printer or cassette

Program notes

1 5 CREDITS
10 SETS THE SCREEN FOR USE
20-30 PSETING VALUES
40 PLOTS POINTS
50 FREEZE

```
1 '******************************
2 '**      3-DEE  MOUNTAIN     **
3 '**           BY             **
4 '**      JEREMY HUGHES       **
5 '******************************
10 PMODE4,1:SCREEN1,1:PCLS:PCLEAR4
20 A$=STR$(RND(18)):S=VAL(A$):S=S+50:W=
S*24 D=(2/2)-24 G=FIX(W/5)-5 KK=128-((W+
D)/2):YY=170-(D):PI=3 141592
30 FOR Y=0TO D STEP2:FORX=0TO W STEP3:P=
SIN(Y/D*2*PI-PI/2)+1 T=SIN(X/W*2*PI PI/2
)+1:H=P*T*G
40 H=FIX(H):XA=X+Y+KK YA=T+YY:PSET(XA YA
-H,1) NEXTX,Y
50 GOTO50
```

3-D Mountain
by Jeramy Hughes

Cruising Challenge

£10 to be won

Can you beat the new high score?

First there was *Space Invaders* then there was *Pacman* — now there is *Cruising*. This all action machine code arcade type game will test your powers of co-ordination to the limit. Never before has a game asked you to think so quickly or move so fast.

Achieving a high score on *Cruising* takes considerable skill and not a little practice. Getting through the first four levels is not easy and that's just the beginning.

Now you can make that skill work for you. *Popular Computing Weekly* is offering £10 each month to the player with the highest score on *Cruising*. All you have to do to enter this month's competition is send a print out of your highest score together with your name and address to:

Popular Computing Weekly
Cruising Challenge
Hobhouse Court
19 Whitcomb Street
London WC2 7HF

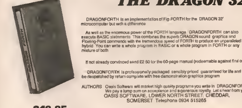
Each month we will publish the name of the winner and the new *Cruising* high score. Are you good enough to accept the *Cruising* Challenge?

The highest score sent in so far this month is 3382 from *Stephen Salmon* of 8 Peterhouse Close Mildenhall Suffolk. If you have a higher score you will win this month's £10 — but hurry entries close on March 31

CRUISING on BROADWAY

Notes

1) Each entry must consist of a ZX printout and your name and address
2) Closing date for this month's *Cruising Challenge* entries is March 31
3) The highest score each month will receive £10
4) High scores cannot be transferred from one month to another
5) The judges' decision is final
6) No employees of Sunshine Publications Ltd or their families will be eligible to enter the *Cruising Challenge*
7) *Cruising (on Broadway)* for the 16K and 48K ZX Spectrum is available through W H Smith and leading computer stores for just £4.95. It is also available mail-order from Sunshine Books Ltd Hobhouse Court 19 Whitcomb Street London WC2 7HF


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Tony Bridge's Adventure Corner

Journey to Middle Earth

Ah, Adventuring! The clang of your broadsword against Orcbone, the relief when a high-level spell works, the dread-filled wait while the dungeon door creaks open to reveal...

After the Space Zap games, Adventures must be the most popular programs for home computers. This week we are starting a regular look at the world of Computer Adventures. We will have reviews of new programs, as well as retrospectives of old favourites.

The main purpose of this column will, I hope, become the exchange of views, ideas and general comment from you, the readers, on Computer Adventuring. One of the advantages of this Forum will be the sharing of *Hints 'n' Tips*. How many times have you wished that *someone* would give you the smallest clue to enable you to get past a troll, or get out of that pesky maze? The computer, on your plea for "*Help*", usually just says "You're on your own, buddy!"

So if you are stuck at any point in an Adventure let us know. If we do not know the answer to your problem, we will ask other readers for their suggestions.

Finally, let us know of a favourite monster, treasure, or location that you have created for your own Adventure. We will publish the most interesting ones in this column. Later in the year, we hope to put together our own *Popular Computing Weekly Adventure*, containing as many of your ideas as possible.

The Hobbit

Can there be anyone who goes on Adventures, and has not read Tolkien's *The Hobbit*? I will always remember reading it for the first time, and the sense of loss when I had finished. *The Lord of the Rings* was, of course, a much vaster undertaking both by author and reader, and, while it alleviated somewhat, that sense of loss, it nevertheless had also lost that air of innocence, or naïvety that pervaded *The Hobbit*.

So Melbourne House's *The Hobbit* (for 48K Spectrum), is very welcome, and is, I believe (tell me if I am wrong!), unique in at least one regard. Not only do you, as *Bilbo Baggins*, react with all the other characters (especially Thorin), but while you are off doing battle or hunting for the Smaug gold, all the other creatures of Middle Earth are getting on with their own lives. Thus you may come back to a location, having left it in a certain state, and find a new situation developing. Nothing is certain in this Adventure, but uncertainty!

Add to this the brilliant graphics that are used to describe many of the locations (although not surprisingly Rivendell), and the almost novel-like running commentary from the computer (this will be *Printed* on command), and we have an Adventure that is going to become a classic for the Spectrum. As the program was originally developed for the TRS-80, we may expect to see it for other machines soon. The price of £15 puts it into the luxury bracket, but for this you get a large box, which contains cassette and 16-page instruction book. This, I am glad to say, includes a dictionary of permissable words (in combination over 500), very welcome if, like me, you always get stuck on how to communicate with the computer! Last, but not least, a paperback copy of *The Hobbit* is also included in the package.

I hope to keep you up-to-date with my progress through Melbourne's Middle Earth; at the moment I have not gone too far — I am either stuck in the Lonelands or in the Goblins dungeon, trying to get out (and any small clue would be much appreciated!)

Next week, I will be looking at another Adventure. In the meantime, remember: *you are never alone with a Balrog!* ■

This is the first in a series of articles designed for novice and experienced Adventurers alike. Each week Tony Bridge will be looking at different Adventures and advising you on some of the problems and pitfalls you can expect to encounter. So if you have an Adventure you want reviewed, or if you are stuck in an Adventure and cannot progress any further, write to Tony Bridge, Adventure Corner, *Popular Computing Weekly*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF.

Hobbit Competition

Who will be first to complete The Hobbit?

Anyone who has ever read *The Hobbit* will be familiar with Tolkien's world of Middle Earth. Elves, dwarfs, hobbits and men rub shoulders with wizards, trolls, orcs and dragons in a land of make-believe.

The Hobbit has recently been turned into a graphics adventure for the 48K Spectrum by Melbourne House (*Popular Computing Weekly*, December 30). In this adventure, you take on the character of Bilbo Baggins and attempt to find your way through to the Dragon's Lair and bring back his treasure. You are assisted, and sometimes hindered, in your quest by Thorin the dwarf and Gandalf the wizard.

Both the characters and the locations are taken from the original book, which provides many clues for the budding adventurer. Where *The Hobbit* differs from most other adventures, apart from the use of graphics, is in Artificial Intelligence. The other characters in the game have independent lives and are quite capable of acting on their own.

The end result is an adventure that is both enjoyable to play but extremely difficult to solve. So, *Popular Computing Weekly*, in conjunction with Melbourne House, is offering a star prize to the first person to complete *The Hobbit*.

If you succeed in solving 100 percent of *The Hobbit* you will find a short message appear on the screen. All you have to do to win this competition is send a copy of this message together with your name and address to:

Popular Computing Weekly
Hobbit Competition
Hobhouse Court
19 Whitcomb Street
London WC2 7HF

We would also like to discover who has progressed furthest in *The Hobbit* so far. Tony Bridge has completed 35 percent — if you have completed more of *The Hobbit* please write in and let us know. We will publish the leading scores each month until someone succeeds in solving 100 percent of the game.

Notes

1) Each entry must consist of two sentences, which you will discover at the end of *The Hobbit*, together with your name and address.
2) The first person to complete 100 percent of *The Hobbit* will win six books (*Understanding Your Spectrum*, *Spectrum Machine Language For The Absolute Beginner*, *Over The Spectrum*, *The Complete Spectrum Rom Disassembly*, *Spectrum Hardware Manual* and *The Working Spectrum*) and a copy of *Crusing on Broadway*, a fast action m/c game.
3) The judges' decision is final.
4) No employees of Sunshine Publications Ltd, Melbourne House Publishers, Sinclair Research Ltd and associated companies or their families will be eligible to enter *The Hobbit* Competition.
5) *The Hobbit* package — 48K Spectrum cassette, full colour instruction manual and *Hobbit* book (£14.95) — is available from Melbourne House Publishers, 131 Trafalgar Road, Greenwich, London SE10.


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Degrees of freedom

Calvin Woodings presents a program for the BBC A and B to calculate Student's "T"

When using measuring instruments, it is often necessary to decide whether or not the difference found between the averages of two small sets of data is due to a real difference between the sets, or due to some measurement inaccuracy. Earlier this century, W S Gosset — working under the pen name of Student — developed a theory to deal with such situations. The resulting significance test was thus called Student's 'T' test.

This program calculates Student's 'T' along with the averages and standard deviations of the data, displaying them all in a table. In addition it calculates the right-tail value of the 'T' distribution curve for the data in question and uses this to tell you the reliability of the difference in averages. This saves the time taken in looking up confidence levels in tables of 'T'.

Four applications of the test are given. Option 1 allows you to compare the average of a set of results with any value which you choose. If you already know the real result, you can use it to check the accuracy of a new measuring device such as a weighing machine.

Option 2 enables you to compare two sets of data from the same population, eg from two sets of measurements using the same instrument. In this case all the results are pooled to estimate the standard deviation of the instrument errors.

Option 3 is used when it would be incorrect to calculate the standard deviation from the combined data; for instance if two different measuring instruments had been used, one for each set of data. Under these circumstances a separate standard deviation is calculated for each instrument.

Option 4 is used when the data can be treated as pairs. For example, if you were trying to see whether there was a real difference between two weighing machines, you might weigh several different weights on each machine and then compare the difference between the results with zero. If the analysis showed that there was no significant difference between zero and the weight differences, you could conclude that the two machines weighed equally.

The final result is in the form "You can be X% confident that the difference between the means is real". If X is greater than 90, there will be less than one chance in 10 of concluding that the difference is real when it had been caused by a measurement error.

The program is reasonably easy to understand with the possible exception of the function at line 380. This routine calculates the right-tail value of the 'T' distribution using the following formula.

$$\tfrac{1}{4}(1 + a_1x + a_2x^2 + a_3x^3 + a_4x^4)^{-4} + e(x)$$

where $|e(x)| < 2.5 \times 10^{-4}$

$a_1 = 0.196854$
$a_2 = 0.115194$
$a_3 = 0.000344$
$a_4 = 0.019527$

and where x is given by the following equation

$$\left(t^{2/3}\left(1 - \tfrac{2}{9d}\right) - \tfrac{7}{9}\right) / \left(\tfrac{2}{9} + t^{4/3}\tfrac{2}{9d}\right)^{1/2}$$

The values of 't' and 'd' are calculated from your data and are Student's 'T' and the Degrees of Freedom respectively.

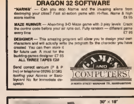
```
10 REM STUDENTS t / SIGNIFICANCE TEST
20 REM (C) C.R.WOODINGS
30 REM VERSION 1,1 / FEB83
40 REM RUNS ON BBC MODEL A OR B
50
60 MODE7
70 FOR I=3 TO 4:PRINTTAB(13,I)CHR$141;"STUDENTS t."
80 NEXT
90 PRINTTAB(17,6)"Menu"
100 PRINTTAB(17,7)"~~~~"
110 PRINTTAB(2,9)"1. Compare data with expected mean value."
120 PRINTTAB(2,12)"2. Compare 2 means from same population."
130 PRINTTAB(2,15)"3. Compare 2 means from different popula
    tions."
140 PRINTTAB(2,18)"4. Paired results.Is difference real?"
150 INPUTTAB(4,23)"ENTER NUMBER OF TEST REQUIRED. "option
160 IF option<1 OR option>4 THEN 150
170 CLS
180 ON option GOTO 200,300,300,200
190
200 PRINTTAB(15,2)"OPTION ";option
210 cols=1
220 IF option=4 PRINT'"      Enter the pairs separated by a
    minus sign. Th
    e computer will find the difference and compare it with
    whatever mean
    value you choose."
230 INPUT'" Enter mean for comparison. "mean2
240 PROCINPUT(cols)
230 PROCCOMPUTE(option)
260 MODE4
270 PROCDISPLAY(option)
280 END
290
300 PRINTTAB(15,2)"OPTION ";option
310 cols=2
320 PROCINPUT(cols)
330 PROCCOMPUTE(option)
340 MODE4
350 PROCDISPLAY(option)
360 END
370
380 DEF FNchances
390 LOCALJ,K,L,R,S,T,X,Y,Z
400 X=1:Y=1:T=t^2
410 IF T<1 THEN 430
420 S=Y:R=dof:Z=T:GOTO440
430 S=dof:R=Y:Z=1/T
440 J=2/9/S
450 K=2/9/R
460 L=ABS((1-K)*Z^(1/3)-1+J)/SQR(K*Z^(2/3)+J)
470 IF R<4 THEN 510
480 X=.25/(1+L*(.196854+L*(.115194+L*(.000344+L*.019527))))^4
490 X=INT(X*10000+.5)/10000
500 GOTO530
510 L=L*(1+.08*L^4/R^3)
520 GOTO480
530 IF T>=1 THEN 550
540 X=1-X
550 X=INT(X*10000)/100
560 =X
570
```

Continued on page 37

Continued from page 35

```
580 DEFPROCINPUT(C)
590 DIMR(C-1)
600 C=C-1
610 IF option=4 THEN 630
620 FOR N=0 TO C:PRINT " Enter no. of items in sample ";N+1;"
    = ";:GOTO640
630 FOR N=0 TO C:PRINT " Enter no. of pairs ";
640 INPUTR(N)
650 NEXT
660 IF R(0)>=R(C) THEN R=R(0)-1 ELSE R=R(C)-1
670  DIM data(C,R),sum(C),sos(C),mean(C),var(C)
680  FOR N=0 TO C
690 IF option=4 THEN PRINT:GOTO710
700 PRINT'" Enter results for sample ";N+1;" now"
710 sum(N)=0:sos(N)=0
720  FOR M=0 TO R(N)-1
730 IFoption=4 PRINT" Pair ";M+1;" = ";:GOTO750
740 PRINT" Result ";N+1;" = ";
750 INPUTA$:data(N,M)=EVAL(A$)
760 sum(N)=sum(N)+data(N,M)
770 sos(N)=sos(N)+data(N,M)^2
780 NEXTM
790 mean(N)=sum(N)/R(N)
800 var(N)=(sos(N)-sum(N)^2/R(N))/(R(N)-1)
810 NEXTN
820 ENDPROC
830
840 DEFPROCCOMPUTE(O)
850 ON O GOTO 860,890,930,860
860 t=(mean(0)-mean2)*SQR(R(0)/var(0))
870 dof=R(0)-1
880 ENDPROC
890 t=(mean(0)-mean(1))/SQR(1/R(0)+1/R(1))
900 dof=R(0)+R(1)-2
910 t=t/SQR(((R(0)-1)*var(0)+(R(1)-1)*var(1))/dof)
920 ENDPROC
930 t=(mean(0)-mean(1))/SQR(var(0)/R(0)+var(1)/R(1))
940 dof=(var(0)/R(0)+var(1)/R(1))^2
950 dof=dof/((var(0)/R(0))^2/(R(0)+1)+(var(1)/R(1))^2/
(R(1)+1))-2
960 dof=INT(dof+.5)
970 ENDPROC
980
990 DEFPROCDISPLAY(O)
1000 CLS:PRINT " THE RESULTS ARE AS FOLLOWS:
1010 ON O GOTO 1020,1150,1150,1020
1020 PRINTTAB(9)"No.",TAB(16)"Sample 1"
1030 PRINTSTRING$(39,"-")
1040 FOR N=0 TO R
1050 PRINTN+1,data(0,N)
1060 NEXT
1070 PRINTSTRING$(39,"-")
1080 PRINT"TOTAL    =",sum(0)
1090 PRINT"AVERAGE =",INT(mean(0)*100)/100
1100 PRINT"STD.DEV.=  ",INT(SQR(var(0))*100)/100
1110 PRINT'"Mean for comparison = ";mean2
1120 IF mean(0)=mean2 PRINT "Means are equal.":ENDPROC
1130 PROCt
1140 ENDPROC
1150 PRINTTAB(9)"No.";TAB(16)"Sample 1";TAB(26);"Sample 2"
1160 PRINTSTRING$(39,"=")
1170 FOR N=0 TO R
1180 PRINTN+1,data(0,N),data(1,N)
1190 NEXT
1200 PRINTSTRING$(39,"=")
1210 PRINT"TOTAL    =",sum(0),sum(1)
1220 PRINT'AVERAGE =",INT(mean(0)*100)/100,INT(mean(1)*100)/
100
1230 PRINT"STD.DEV.= ",INT(SQR(var(0))*100)/100,INT(SQR(var
(1))*100)/100
1240 IFmean(0)=mean(1) PRINT "The means are equal.":ENDPROC
1250 PROCt
1260 ENDPROC
1270
1280 DEFPROCt
1290 PRINT'"Students t = ";ABS(INT(t*100)/100)
1300 PRINT' You can be ";100-FNchances;"% confident that the
difference in means is real."
1310 ENDPROC
```





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Designer

This is an extract from **Designer**, *one of the programs in the chapter on graphics in* The Working Spectrum, *a book by David Lawrence, published by* **Sunshine Books Ltd**, *Hobhouse Court, 19 Whitcomb Street, London WC2 7HF. £5.95 228pp*

3.5 Designer

I have a special fondness for this program because the ideas on which it is based were not my own: they were taken from an excellent book "The Principles of Interactive Computer Graphics" by William M Newman and Robert F Sproull. The reason I say fondness is that the program serves as a reminder to me of how much there is always to learn about the principles of programming and how many fields lie waiting to be opened up for no more cost than the price of a few books.

Based on two simple procedures taken from the book, this program allows you to define a design of up to 65536*65536 pixels across, to add and to delete to examine the design at various scales and to rotate all or part of it on the screen. Once its use is mastered it is capable of being used in a variety of applications where it is desirable to be able to change and manipulate designs quickly and easily.

Module 3.5.1

This is a standard menu module.

Module 3.5.2

The functions and variables defined here will be discussed during the course of the commentary on the program.

Module 3.5.3

The function of this module is to take two sets of co-ordinates, X1/Y1 and X2/Y2, and to decide whether any part of the line drawn between the two points so defined will pass across the screen. If any part of the line does fall on the screen, it is drawn, other parts of the line are rejected.

Commentary

Line 1310: The screen forms a window on the overall design being created and the borders of the area to which the screen points are stored in the variables TOP, BOTTOM, LEFT and RIGHT. If BOTTOM is set to 500 and LEFT to 500, the screen will set to display any pixels which fall between 500 and 755 horizontally and 500 and 667 vertically. The purpose of this program line is to disqualify from consideration any line in the design which both starts and finishes above, below or to one side of the area of the design covered by the screen.

Lines 1320-1330: If a line starts above or below the area covered by the screen, these two lines reset the variable EDGE to coincide with the top or bottom of the screen.

Line 1340: For lines which begin above or below the screen, this line calculates the horizontal position at which the line will pass the top or bottom edge. The formula in the first half of the line says nothing more complex than that if, for instance the line in question passes through the top edge of the screen halfway through its vertical component, it will also be halfway through its horizontal component. Clearly this will only hold true for straight lines.

Lines 1350-1430: The same procedure is carried out in relation to the co-ordinates Y1, X2 and Y2.

Line 1440: Since it is possible for a line not to lie entirely above, below or to one side of the screen and still not cross the screen itself this program line checks that the co-ordinates calculated do in fact lie on the screen. If they do, then the first set of co-ordinates is plotted and a line is drawn to the second. ■

Module 3.5.1

```
892 REM ********************
 10 REM
    REM ********************
    INK 0  P                 INT
     2: INK                  IGNE
    PRINT "
1050 PRINT "              ALISE DI
 LAY
    PRINT "                 LINES
    PRINT                    ATE"
    PRINT      4           E LINES
    PRINT      5
    INPUT Z$  CLS
    IF Z$= 1  THEN GO SUB 1150
    IF Z$= 2  THEN GO SUB 1530
    IF Z$= 3  THEN LET SEARCH=0
 GO SUB 1700
1140 IF Z$= 4  THEN LET SEARCH=1
 GO SUB 1700
    IF Z$= 5  THEN GO TO 11
    CLS   GO T  1000
    INPUT  DO  O  WISH TO SAVE
    DESIGN?   U$  IF D$= , THE
      DESIGNER   PRINT  REWIND
     ANY KEY TO VERIFY   PAUSE
     IFY  DESIGNER   PRINT "VER
  "
 100 STOP
```

Module 3.5.2

```
1190 REM ************************
 200 REM INITIALI E
  10 REM ************************
    LET LEFT=0  LET BOTTOM=0  L
    TOP=167  LET RIGHT=255
    LET A$=
    DEF FN A( )=256*CODE (A$(I)
    E A$(I+1)
    DEF FN A$ )=CHR$  NT  TX1
       T  1 256*INT  TX1/256))
    INT (T  1 256)+CHR$ (TY1-25
    (T 1/256))
    DEF FN B$( )=CHR$ INT (TX2/2
    +CHR$  TX2-256*INT (TX2/256
    HR$ INT (TY2/256)+CHR$ (TY2-25
    INT (TY2/256))
 2 0 LET A$=     RET RN
```

Module 3.5.3

```
1280 PEM ********************
1290 REM DRAW
1300 REM ********************
1310 IF (Y1 LEFT AND
 (X1)RIGHT AND Y2>R
TOP AND Y2>TOP  OR (Y1
D Y2'BOTTOM) THEN LET
UPN
1320 IF Y1>TOP THEN LET
1330 IF  1 BOTTOM THEN LET
BOTTOM
1340 IF Y1 BOTTOM OR Y1>TOP THEN
 LET  1=X1+(X2-Y1 *(EDGE-Y1   Y2
-Y1)  LET Y1=EDGE
1350 IF Y2>TOP THEN LET EDGE=
1360 IF Y2 BOTTOM THEN LET EDGE
 TTOM
1370 IF Y2 BOTTOM OR Y2/TOP
 ET  2=X2+( 1 X2)*(EDGE-Y2)/(
 Y2   LET Y2=EDGE
1380 IF  1>RIGHT THEN LET E
IGHT
1390 IF X1<LEFT THEN  ET EDGE
FT
1400 IF  1 LEFT OR X1>RIGHT
 LET Y1= 1+(  2  1 *(EDGE-X1)/(
-X1   LET X1=EDGE
1410 IF X2 RIGHT THEN LET EDGE
IGHT
1420 IF X2 LEFT THEN LET EDG
FT
1430 IF X2<LEFT OR X2>RIGHT THEN
 LET Y2=Y2+(Y1-Y2 *(EDGE-X2)/(X1
-X2   LET X2=EDGE
1440 IF  1-LEFT >=0 AND X2-LEFT
 AND X1-LEFT<=255 AND X2-LEFT
255 AND Y1-BOTTOM>=0 AND  1
 M -167 AND   -BOTTOM =0 AND
BOTTOM =167 THEN PLOT  1-LEFT,
BOTTOM+8  DRAW INT (X2-X1) INT
 (Y2-Y1)
1450 RETURN
```

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SHARP BARGAIN, PC 1500 pocket computer + CE 150 4-colour printer + 8K Ram module + software all £360 ono Tel 06667 546

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Wanted

8 OR 16K RAM PACK for Vic20 Tel Lincoln (0522) 702644

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SPECTRUM 32K upgrade for issue one Details and price Tel 0782 792728

BBC MODEL B Tel Cheswal 570879



SOLUTION IS A FREE COMMAND

J J Morgan of St Edwin Gardens Heath, Cardiff, Wales, writes

Q **I was reading a letter from P Charlton in one of your issues He has the same problem as I, but I own an Atari 400 I have searched through the manuals, but there is nothing on how to find out how much memory you have left in your program, or how much you are using. Can you help?**

A You should not have this problem on an Atari as it has a *Free* command Just enter this, and it will return the amount of memory left to the user as a number of bytes

BREAK OUT ON THE ORIC

David Donald of Birmingham writes

Q **Like other people, I am trying to decide whether to buy an Oric-1 or a Spectrum I wonder if you could answer some questions about the two machines to help me make up my mind**

Does the Oric have *Print At* and *Screen* like the Spectrum, or does it have equivalents? In the same way, does it have *In/Out* commands and *Read/Data* Can joysticks be used and how easy will it be to use a proper printer? I have heard that it will be easier to interface other add-ons to the Oric than to the Spectrum Is this true? How easy will it be to convert ZX programs to the Oric?

A Suddenly everyone wants to know about the Oric the Oric does not have *Print At* or *Screen$*, but it does have *Curmov* and *Curset* These will move the cursor to any point on the screen and print a pixel at that point, which then can be moved It is also possible to print characters at a particular point using these commands

There is a short one line program to save a screen picture, but there are no *In/Out* commands Both *Read* and *Data* are available There are no joysticks for the Oric yet, though I would expect some to come on to the market sooner rather than later

The Oric has an advantage over the Spectrum in that it has a Centronics port, which will make it easy to interface with many printers The Oric can also be used with most normal cassette players

The Oric uses a 6502 chip and Microsoft Basic, so there will be several small differences between the two machines Spectrum string handling uses *'From To'* to split strings whereas the Oric uses *Left$*, *Mid$* and *Right$* The variable names can only be two characters long, though the sound commands are different by virtue of the fact that the sound facilities of the Oric are far more comprehensive than on the Spectrum The Oric also features an emergency button to break out of closed loops and other user-induced crashes

As long as no serious hardware problems develop, and the new manual is good then I can see the Oric soon putting increasing pressure on the Spectrum market

STUDYING CRIME AT 'O' LEVEL

D W Williams of Oxford Street, Blaenau Festiniog, Wales, writes

Q **For my 'O'-level in computer studies I am putting together a project on the subject of computer crime I was wondering if you could put me on to any accounts of notable computer fraud? Also, do you have any information on the types of programs and measures that are used to combat both active and passive fraud**

A By its very nature, this is not the sort of subject that lends itself to easy answers Big companies are extremely touchy about their security measures, and are unlikely to divulge them If such information were printed it would make the work of a thief much easier

The only obvious sign of increased security is the need for identification that most companies now demand in their computing areas The days are long gone when you could walk in with a fake appointment ask the way to the toilet get lost and find the computer room

Your only hope is to write to the various national newspapers and ask them to supply you with information You can write to the major computer companies, but do not expect any real answers — this is a security measure in itself

VOICE DETECTION CYCLES

Julian Miller of Ryash Maidstone Kent, writes

Q **I am the owner of a 48K Spectrum. I wonder if you could tell me how the *In* and *Out* commands work How can they be used to detect a signal coming in on the 'EAR' socket The manual does not go into enough detail Also, could a voice recognition program be made out of the detection of such a signal?**

A This is the sort of question that needs an article to answer it properly You want to look at address 254 *In* 254 is not sufficient, as we are dealing with a 2 byte address The first byte of this deals with the keyboard, and the ports D0 to D4 All the bits in this byte need to be set to one Also, because the second byte deals with ports D5 to D7, and the EAR socket is D6 a base has to be found for no signal at the ear socket

```
PRINT IN (255 * 256) + 254
```

This will return a value n' which is the value of D5 to D7 without a signal The line returns the value of 1 to all bits in the first byte If there was a signal coming through the EAR socket this would return the value of 'n + 64

The only thing that remains is to read the value of the signal 'n' is no tone, and n + 64 is a tone Unfortunately Basic can only handle about 50 or 60 instructions a second, but the human voice can be two or three thousand cycles per second The only possible way of interpreting this number of cycles is in a machine code routine As far as I know there is not yet one generally available

GIVING THEM A PLUG

T C Choy, Peel Road South Woodford, London writes

Q **I have a 16K Spectrum and would like to expand it to the full 48K My Spectrum has the new pcb with 12 IC sockets, two of which are 14 pin and the rest 16 pin According to your issue number 25, East London Robotics can supply these at £25, but I have been unable to contact the firm Can you tell me which chips I need? If they are the normal 2114s, then I can easily obtain them from an electronics retailer. I would rather not send my Spectrum back to Sinclair, wait three months and pay more money.**

A East London Robotics is in the process of moving, so there are some understandable temporary upsets I also believe there has been some trouble in getting the correct Ram chips for the Spectrum Sinclair is using chips that are accessed at 150 nanoseconds

There is an alternative to East London Robotics — Fountain is doing a complete set of chips for £24 50 This includes the same 4523s that Sinclair uses and the two necessary decoding chips (the two 14 pin sockets) The price is inclusive of postage and packing and VAT Fountain will also include free details of how to adjust the colour on the Spectrum if you buy the chips The address is Fountain Computers Ltd, Darville Road, Alresford, Hants SO24 0BW

Is there anything about your computer you don't understand, and which everyone else seems to take for granted? Whatever your problem *Peek* it to Ian Beardsmore and every week he will *Poke* back as many answers as he can. The address is *Peek & Poke*, *PCW*, Hobhouse Court, 19 Whitcomb Street, London WC2 7HF

Ziggurat



Right *is* wrong

If there is to be *artificial* intelligence we surely need to know what intelligence is in the case of humans

There are many theories about the nature of intelligence and the ways in which it might be measured but much of the work carried out in this direction seems to be rather inconclusive

Pascal (the philosopher not the programming language) made the astute observation in his *Pensées* The greater intellect one has, the more originality one finds in men Ordinary persons find no difference between men The truly intelligent person is the person who sees implications and differences in what others consider to be one problem (As I have noted before divergent thinking rather than convergent thinking)

Traditional intelligence tests are predicated on the convergent mode of thinking there is only one correct answer to a question This is the style of thought encouraged by the use of only one language and one method of programming There is — again — the notion that there is only one correct way to write a program As an example of the inadequacies of traditional approaches to intelligence consider this question from a personality test (the Cattell 16PF Form C) "Which is the odd one out? *run*, see or *touch*

Think carefully about your answer Before I give the correct answer consider how you would answer this question What is the next in the series 1 3 5, 7, ? In both cases you are being asked to find a *rule*, and it is possible to see that a computer might do quite well at intelligence tests (assuming that it had a large enough base of information on which to call) Perhaps computers might be intelligent in this sense or *potentially* so — but is this really what we mean (intuitively) by 'intelligence ?

The answer to the odd-one-out question provided by the producer of the attitude test was *run* This is obviously wrong The correct answer is that *all* the words can be considered legitimately to be different from the other two (eg *touch* does not have three letters) A better answer (and the answer which would be truly indicative of intelligence) would be All of them for the following reasons Intelligence tests should be designed to give most marks to those who could find most answers to a question marking in terms of the quality of the reasons Impossible to do but at least trying to appear relevant.

To the question of the series of numbers — there are two immediately obvious answers 9 (the next odd number) or 11 (the next prime number) or not so obvious, 2 (it has been missed out) We should measure intelligence by the ability to *construct* rules rather than the ability to guess the rule that the constructor of the test wanted It is the human ability to find rules that makes us different.

These two lines are fairly clear in operation

```
1000 IF X=Y THEN GOTO 2000
1010 PRINT "Different"
```

As we are able to put successive lines together by use of colons in many Basics then that should be permissible

```
1000 IF X=Y THEN GOTO 2000 : PRINT "Different"
```

In many Basic versions it is not as you would expect however Try it and see It is not an illegal line, rather the meaning is not self-evident and rather *ad hoc* extra rules have to be supplied Rules are important.

I will continue this next week, but I leave you with this line of Pascal (the language this time) to work out what it *should* mean

```
IF X=Y THEN IF A=B THEN C :=0 ELSE D :=0
```

If you know the answer, why is it so? ■

Boris Allan

Puzzle

Two-step division

Puzzle No 45

③⓪④⑧⑤①⑥⑦②⑨

Ten discs, each bearing a digit from 0 to 9 As you see they are divided into two groups such that 3048516 is a perfect square (1746^2) and 729 is a perfect cube (9^3)

Can you divide the discs to form two numbers that are the square and cube of the same number?

(Inverting the 6 or 9 is not allowed!)

Solution to Puzzle No 40

We know that *A* must be larger than 35, since $(A - 4)^2$ has four digits (clue 3 down) and *A* is less than 60 (clue 4 across) Similarly *B* is greater than 9 (clue 2 across) and must be less than 64 (clue 4 across)

```
10 FOR A = 36 to 60 20 FOR B = 10 to 64 30 LET A$ = STR$ A 40 LET B$ = STR$ B 50 LET C = A + B 60 LET C$ = STR$ C 70 LET D = A * A + B * B 80 IF D > 9999 THEN GOTO 220 90 LET D$ = STR$ D 100 IF D$(1)<>B$(1) OR D$(2)<>C$(1) THEN GOTO 210 110 LET E$ = STR$ (A + 7) 120 IF E$(1)<>C$(3) THEN GOTO 210 130 LET F$ = STR$ (A * A) 140 IF F$(3)<>G$(4) THEN GOTO 210 150 LET G$ = STR$ ((A - 4) * (A - 4)) 160 IF G$(1)<>B$(2) OR G$(2)<>C$(2) OR G$(3)<>E$(2) OR G$(4)<>F$(4) THEN GOTO 210 170 LET H$ = STR$ (A * A - A * B) 180 IF H$(4)<>F$(1) THEN GOTO 210 190 PRINT A, B 200 STOP 210 NEXT B 220 NEXT A
```

This gives the result A=47 and B=21

Winner of Puzzle No 40

The winner is M A Regan, Bumby Close, Harrogate North Yorkshire, who receives £10

Top 10

Spectrum

1 (1) Penetrator (Melbourne House)*
2 (2) The Hobbit (Melbourne House)
3 (4) Horace Goes Skiing (Psion/Melbourne House)
4 (5) Time Gate (Quicksilva)
5 (6) 3D Tanx (DK'Tronics)
6 (—) Centipede (DK'Tronics)
7 (8) Flight Simulation (Psion)
8 (9) Football Manager (Addictive Games)*
9 (7) Spectrum Micro Chess (Artic)
10 (3) Arcadia (Imagine)

*Requires 48K.
(Figures compiled by Buffer Micro Shop, London 01 769 2887)

ZX81*

1 (1) Flight Simulation (Psion)
2 (3) Frogger (DJL Software)
3 (6) Kong/Dracula (Tony Barber)
4 (7) Football Manager (Addictive Games)
5 (5) Mazogs (Bug-Byte)
6 (4) Gulp II (Campbell Systems)
7 (8) The Fast One (Campbell Systems)
8 (9) Sea War (Panda)
9 (10) Pirhania (Automata)
10 (2) 3D Defender (JK Greye)

*All 16K.
(Figures compiled by Buffer Micro Shop London 01 769 2887)

Vic20

1 (4) Abductor (Llamasoft)
2 (1) Frog (Interceptor Micros)
3 (3) Andes Attack (Llamasoft)†
4 (6) Traxx (Llamasoft)†
5 (7) Gorf (Commodore)*
6 (2) Alien Attack (Interceptor Micros)
7 (—) Arcadia (Imagine)
8 (10) Grid Runner (Llamasoft)
9 (8) Skramble (Rabbit)
10 (—) Krazy Kong (Interceptor Micros)

*Cartridge †Requires 8K or 16K.
(Figures compiled by Vic Centre, London [illegible])

Atari

1 (10) Sea Dragon (Adventure International)
2 (2) Miner 2049er (Big Five)*
3 (5) Preppie (Adventure International)
4 (—) Scott Adams Graphics Adventure 1 (Adventure International)‡§
5 (4) Snooker and Billiards (Thorn EMI)*
6 (6) Star Raiders (Atari)*
7 (—) Royal of the Jungle (Microgames)‡
8 (—) Galaxians (Atari)*
9 (7) Stratos (Adventure International)
10 (—) Astro Chase (First Star)†

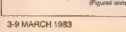
*Cartridge. †32K cassette. ‡32K disc. §48K disc.
(Figures compiled by Games Computers, Birmingham 021-632 6458)

Books

1 (4) Assembly Language Programming for the BBC Micro, *Birnbaum* (Macmillan)
2 (—) The Working Dragon 32, *Lawrence* (Sunshine)
3 (3) Compute!'s First Book of Vic *various authors* (Compute!)
4 (1) Spectrum Machine Language for the Absolute Beginner, *Tang* (Melbourne House)
5 (2) Creative Graphics on the BBC Micro, *Cownie* (Acornsoft)
6 (7) Understanding Your Spectrum, *Logan* (Melbourne House)
7 (—) Compute!'s Second Book of Atari *various authors* (Compute!)
8 (—) Load and Go With Your Dragon *Phipps* (Phipps)
9 (9) Mastering the Vic20 *Jones* (Horwood)
10 (8) Z80 Assembly Language Programming, *Leventhal* (Osborne)

(Figures compiled by Watford Technical Books, Watford 0923 23324)
(Last week's position in brackets)






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